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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



SEE PAGE 424

IN THIS ISSUE

Albert Payson Terhune

Hiram Maxim

Winston Churchill "Cannonball" Baker

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are many

for the Radio Trained Man

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Mystery "TWIN-RAY" Light Tested— Reads Newspaper At 1,000 Feet!

SEVERE TEST GIVEN NEW SAFETY LIGHT

June 24th: A demonstration of the new Auto Safety Light, designed for sale with drive, was given at the Boston airport on Friday night before an interested gathering of pilots and automobilists. The first test was the ability to read a newspaper at a point of 1,000 feet in front of the light and a foot above the ground, proving that while the light was perfectly of the light, the rays from the illuminated, the rays from the light were at no point above the center of the light itself. Consequently there would be no glare in an on-coming car, showing the light powerful enough to penetrate the lights of the on-coming car and show clearly the road beyond and any obstacles in it.



Lights Highway Ahead With 67,000 Candle Power Beam

Reporters for the Boston Sunday Post witnessed a demonstration of this light and above is a reprint of their report.

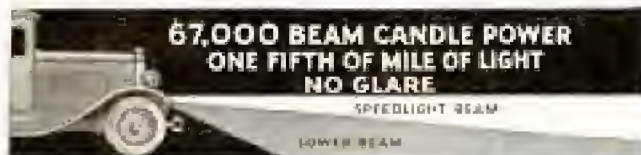
Now—judge for yourself what you can do with a light like this on your automobile—a light that throws a 67,000 candle power beam, for over 1,000 feet—lights up all road signs and curves long before you reach them. Makes the road ahead of you as bright as day yet absolutely can't glare in the eyes of approaching drivers. A road light that literally takes the light

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this wonderful light to protect human lives and property against glaring lights, fog, rain and darkness. Hundreds of men have made big fortunes out of makeshift spot lights and painted bulbs that only did half the job. Send the coupon and find out how you can use this great device to build up a crew of your own—and double your earnings—earnings which by themselves will be bigger than you ever saw before. Do it now, before you turn this page.



Cuts Through London Fog and Darkness Like a Knife

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Do Unseen Hands Keep You Dumb.. When You Ought to Talk.



How often have you wanted to talk, but held back, silent, because you felt unequal to the other people present? How many times have you passed up, or avoided the chance to talk in public—before your business associates, your club or lodge, because of your fear of stage fright? Are you afraid of your own voice—instead of being able to use it as one of the greatest business and social assets in your possession? And yet you might be surprised to hear that many of the most brilliant public speakers we have today felt exactly this way—before they learned how to develop their "hidden knack" of powerful speech—a knack which authorities say seven men out of every ten actually possess. And the chances are that you, too, have in you the power of effective speech—which, if unlocked, would be almost priceless to you in a social or business way. Find out if you have this natural gift—read every word of the message below.

Discover These Easy Secrets of Effective Speech

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Vol. 57

March, 1932

No. 3

Special Features

Coming—The Silent Air Liner	353
Crystals that Talk and Sing	362
"Bug-Men" Lead Hunt for Black Gold	370
Kindness Can Kill Them	378
Get the Story!	404
Magic for Everybody	434
In a World of Terror	442
Latest Miracle of the Plant Wizards	452
From Europe to New York by Rocket?	458

Advertising—figures dangling on ladder draw crowds	403
Airplanes	
autogiro with engine behind is pushed through air	415
propeller-pitch gauge	431
Animals—dummy "Daniel" shows fate of man in lions' den	402
Archaeology	
first Eskimo mirrors found are made of slate	368
here is the oldest picture of man on horse	368
Army, U. S.—"T-2" Uncle Sam's latest tank	356
Automobiles, Accessories	
car speed recorded in crash by speedometer lock	364
crankcase is kept filled by automatic oiler	438
mirrors on light bulbs eliminate glare	353
Automobiles, Design—auto without an axle gives better ride	377
Automobiles, Repairing—hand tool irons out dents in fenders	439
Automobiles, Trailer—dry-land yacht has all comforts of home	440
Automobiles, Truck	
steel rock-catching shield protects driver	369
thirteen-day non-stop trip tests diesel truck	403
Aviation	
cradle to land wheel-less glider on roofs	424
plane shot over waterfall to make it take air	461
Bacteria—sound waves kill germs	368
Bat—has leaflike nose and "file" for tongue	373
Battleships—the latest in fighting ships and their eyes	376
Boats and Boating	
metal cans driven by foot like a bicycle	439
throttle runs whole boat by one-lever control	416
"Venetian blind" sails add to yacht's speed	353
Books—book printed on paper strip	356
Bridges	
masonry trestle built without forms	357
weights test model bridge for loads and storms	441

Building Construction—metal walls for buildings to lower costs	401
Building Materials—waterproof and stainless material for builders	414
Caisson—giant shell digs own pit in ten minutes	359
Camera—takes three colors all in one "shot"	438
Checks—signature stencil for guards against fraud	355
Cider—is made by the glass in fountain juicer	368
Clocks—clock face six stories tall	375
Crime—perfumed muckleg solved mail thefts	456
Disease—heat applied to rheumatism by short-wave radio	357
Drafting—tape used on drawing board instead of tacks	441
Elevators—moving a city straight up task of	449
Engines, Diesel—auto repair spends half million on	365
File—rubber grips for, protect hands	402
Fires—filmed for future study	412
Flashlight	
handy mounting for service light	470
suspended from neck leaves hands free	424
Furnace, Electric—rocks and wood turn to gas in	360
Greenhouse—that brings plants to buyers	412
Heating and Ventilating—weather factory for home heats or cools air	356
Holder—for watch, cigarets and memorandum pad	377
Household Devices	
House Moving—house moved across a river with aid of barge	451
Level	
for lines or surfaces	433
that fits your pocket also contains a rule	446
Life—third class of living things would include fungi	402
Locomotives—Stephenson's engine model valued highly	448
Maps	
old map throws new light on Columbus	384
state map on auto radiator	387
Models—yacht dock for model boats	450

[Continued on Page 4]

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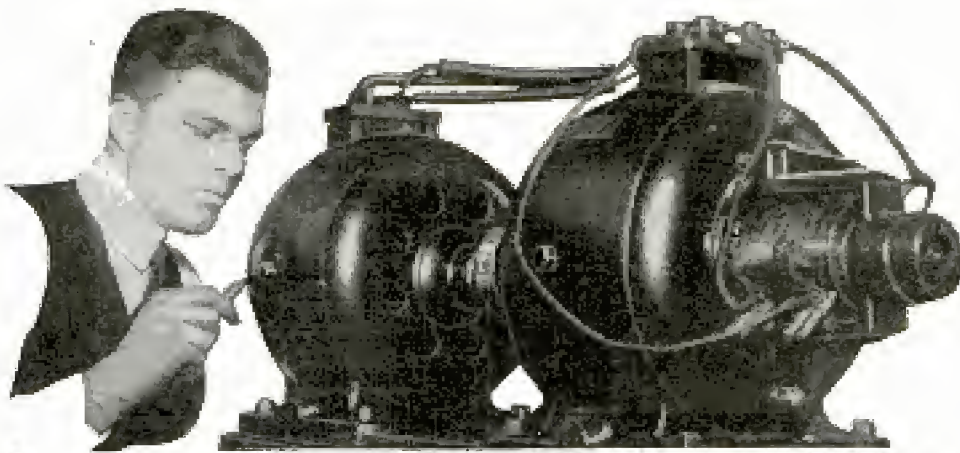
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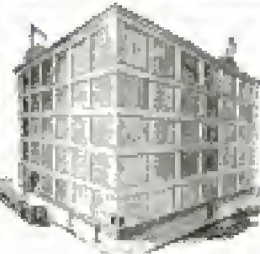
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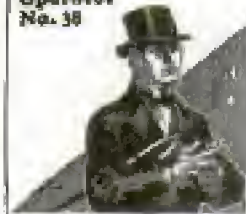
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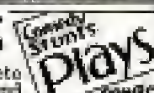
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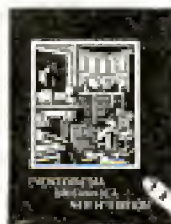
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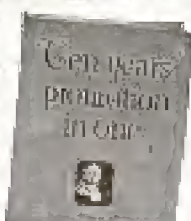
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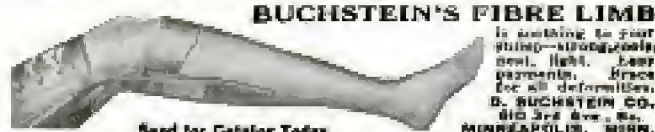
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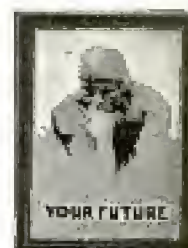
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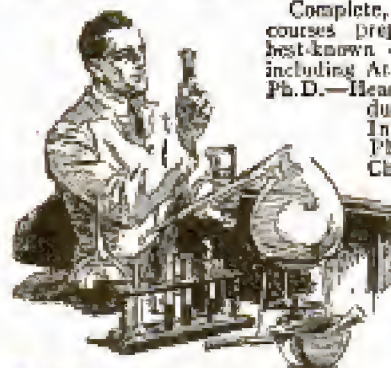
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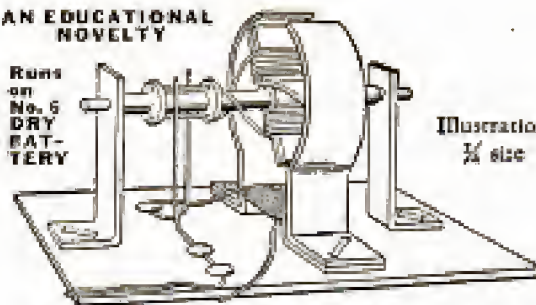


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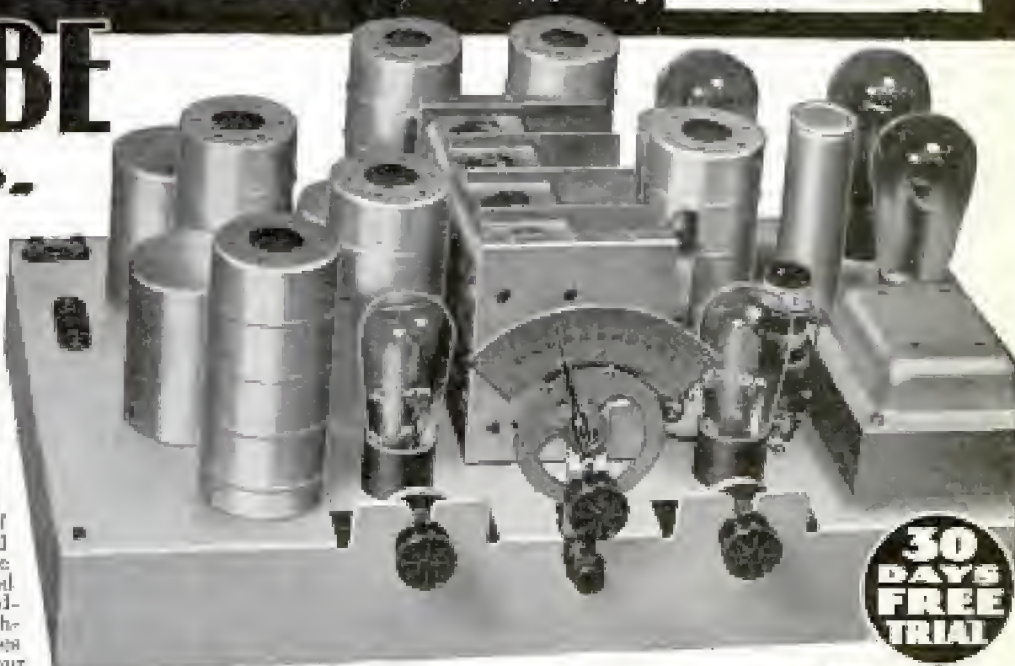
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Up to

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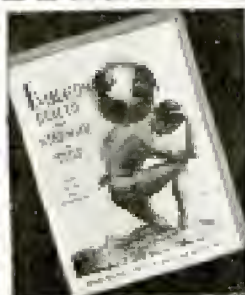


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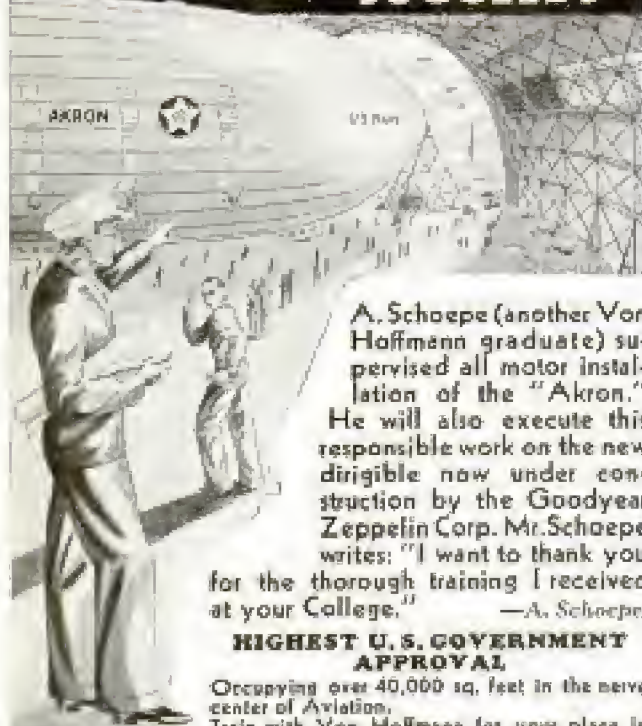
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TIME Counts in applying for patents. See pages 134 and 135. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

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THAXBY Formulas produce perfect products. All lines. Catalog free. H. Thaxby Co., Washington, D. C.

GOOD Paying job open as local representative, old successful manufacturer selling direct to wearer. Sensational values pants, breeches, overalls, shopcoats. Largest line in field. Held free with every 3. Big cash commissions. Outfit free. Longwear, Dept. 23, 429 Broome St., New York.

REPRESENT Manufacturer of shirts, ties, hose, underwear. Best store competition on price and value both. Startling free offers make orders come easy. You earn big money. Cash commissions, free shirt offer, cash bonuses. Write today for giant outfit free! Dept. M30, Albert, 806 Sixth Ave., New York.

CASH Paid for butterflies, insects. See Similar Display Advertisement on page 12.

BIG Profits selling groceries, motor oils, paints, stock minerals. Sample case free. Lorenz & Brown, 1692-C So. State, Chicago.

STRANGE Ironing cord. Presents ironing. Saves electricity. Abolishes kinks, marks. Approved by Good Housekeeping. For telephones also 250% profit. Samples furnished. Nereskin, Dept. 3-A, 4303 Lawrencewood, Chicago.

MEN, Women wanted to represent manufacturer locally. Earn big money. Pleasant work showing shirts, ties, underwear, hosiery. Guaranteed one year. Amazingly low priced. Sensational merchandising ideas gets orders. No experience. Free sales outfit. Dept. J3, Quaker, Broadway and 31st Street, New York.

AMAZING New metal electric sign. Automatically flashes electric designs in brilliant. Illuminated Neon effect. Sensational sight seller, \$2.95 retail. Dept. 111, Red Lion Co., 215 Fourth Ave., New York.

300% PROFIT Selling Masters Gas Lighter. Retail 35c. Costs you \$1.00 doz. Sample free. Square Deal Mfg., Desk PM-29, Bradford, Pa.

ELECTRIC Water heater—New. Heats water instantly. Pocket size—retails \$9.75. Two minute demonstration makes you \$1.95 profit. Lux-Viel, Dept. 37, Elkhart, Ind.

BUY 500,000 Articles wholesale, 200 jobbers, manufacturers directory 25c. Aris, R-1611-M, Denver.

MARVELOUS Chemical cloth, cleans, polishes all metals instantly without liquid, paste, powder; record-breaking seller to housewives, stores, offices; 300% profit; sample free. Shef D. Mfg. Co., Weehawken, N. J.

NEW Principle lifetime stropper for safety razor blades. Latest out. Costs few cents. No cracking—no effort. Amazing free offer to workers. Park Specialties, 219 Park Place, Brooklyn, N. Y.

NEW Hemstitcher, ruckmaker, darning, embroidery—guide. Fits any sewing machine. Retail 99c and dollar. Sample dime. Agents, demonstrators wanted everywhere. K. J. Manufacturing, 618 N. Vermont, Los Angeles, California.

SELL Blades, notions, novelties, toiletries. Our sensational prices challenge world. Free catalogue. Mills Sales Co., 601 Broadway, New York, or 37 South Wells Street, Chicago.

\$10 EARN 22c Weekly. Presto sharpener puts keen edge on dulled scissors. Quick demonstration sells it. Day's supply carried in your pocket. Sell 25c. Cost \$1.20 dozen. Gross \$10. Williams Corp., 32 Williams Bldg., Montclair, N. J.

"BRING Back Beer and Prosperity." Sell these signs. Sample dime. Husman, 2240 Blackrock Ave., N. Y.

SELL Made-to-measure raincoats for men, women, children from \$3.95 up; big weekly income. Outfit free. Goodway Rainwear Co., 18 West 22nd St., New York City.

EARN Big, steady cash, representing old established manufacturer, selling fine shirts, ties, underwear, hosiery direct to wearer. Free shirt, tie offer. Free besides cash bonuses regularly. No investment required. Expensive sales outfit free. Write today. Dept. L3, Rosenthal, 1225 Broadway New York.

FAST Sellers! Metallic polishing cloth, new way smoother, gas lighters. Other big profit items. New low prices. Superior Company, 1103, Baltimore, Md.

AGENTS Wanted. To sell Phenoris (a real tooth powder) made by pharmaceutical house 40 years experience. Perhaps your territory is available. Send 10c for sample. Kasler sold. R. J. Strassenburgh Co., Rochester, New York.

AGENTS Sell to housewives. Cost 25c, retail 15c. Particulars. Miller Company, 504 East 125 St., Bronx, New York.

EXPERT Valued our \$3 genuine Bludash rem \$900.00. Dazzling brilliancy, flashing rainbow fire accents big, quick profits. Guaranteed 20 years. 45 sample case free. Mexican Glass Co., Salto P.M., Monterey, Calif.

400% PROFIT Selling signs used everywhere. Largest selection, wonderful record business. \$1.00 worth samples, 25c; 50 signs \$2.00; 100 signs, \$5.00. P. Franklin Co., 3224 Third Ave., N. Y.

AT Last, scratch eraser that heals scratches on finest furniture. Rub lightly—scratches disappear. Sells on demonstration. 100% profit. Agents being appointed. Write. Freeman, 696 So. Broadway, Denver, Colo.

100% PROFIT In new everlasting match lighter. No flint or friction. What makes it light? No wind can blow it out. Retail 50c. Sample and sales plan 25c. New Method Manufacturing Co., Box PM-3, Bradford, Pa.

TWO Superior formulas. Business building products. Special introductory price \$1.00. Expert analysis. Skillful personal guidance in establishing your own business. Atlantic Research Laboratory, 1591 Euclid, Cleveland.

ELECTRIC Water heaters. Guaranteed shock proof. Send \$1.25 for agents sample. Free circulars. Arline, 6832 Wentworth, Chicago.

\$25.00 REWARD For any cure Great Christopher "Positive" Cream Cure cannot remove; relieves painful burnings; removes warts, moles, calluses; earn \$5-\$8 daily; sample 25c, particulars free. Reliable Specialty Corporation, Buffalo, N. Y.

NEW, Profitable—Sell auto stop mats. Quality rubber with owner's name molded into. Details free. Rhonite Products, Dept. C-40, 395 Main, Akron, Ohio.

MAPS—Big profits, no competition, experience unnecessary. Every office and retailer prospect. New proposition never before offered. Sells itself. Mid-West Map Company, Aurora, Missouri.

AGENTS Sell the Dancing Itell Hop, World's greatest clog dancer. Sample \$1. R. Samuelson, 224 Stevens St., New Brunswick, N. J.

EVERY Poor people must keep clean. Brushes, brooms, mops sold by the millions. Sell them in your own name. 200 per cent profit. Write for proposition. Wm-Grip Sanitary Brush Corp., 41 E. 11th St., New York.

GENUINE Gold Leaf Letters anyone can put on store windows. Guaranteed to money making. Large profits. Enormous demand. Free samples. Write today. Metallic Letter Co., 438-D North Clark, Chicago.

MANUFACTURER Of plastic leather wants agents. Besides shoes—rubbers—8c pair. Thrives on depression. Details and sample. E. W. Parker, Pierce Ave., Salem, Mass.

MEXICAN Hand made leather pictures. Most artistic, beautiful, attractive. Novelty work. Great margin of profit. Send 25 cents for \$1.00 worth sample and details. Mexican Art, Apartado 1203, Mexico City.

ELECTRIC Signs, new process on glass, any wording; low price. Twined, 113 West 22nd, New York.

EVERY Loving mother wants her baby's first shoes permanently preserved by "Metalizing." Makes beautiful, lasting mementos. Excellent commissions. Williams-Craft Co., Dept. M, Charleston, S. C.

AGENTS Sell guaranteed Aschlaran on hose and lingerie. Something women buy. 300% profit. Sample 25c. Western States Distributing Company, 815 South Hill, Los Angeles, California.

WONDERFUL Opportunity to make big money with sensational new invention. Sells to housewives, apothecists, grocers, gas stations, etc. Large profits assured. Steady earnings. See page 55 this magazine, or write Gro. Prod. CC14, Bloomfield, New Jersey.

TOILET Soap, creams, shampoos. Enormous profit. Williams Mfg. Co., North Bellmore, N. Y.

NEW Invention? Fastest-selling household necessity. 25c. Big profits. Gilbert Supplies, 16 East 23rd, New York.

SELL Hasty-Cake maker, the greatest staple food discovery in 20 years. Enough in 25¢ package for delicious three-layer cake. Two flavors, devil's food, oriental sauce. A fast, sure repeater. Average home uses two cakes per week. Half million packages sold in last month. You can earn up to \$10 per day. No experience needed. We furnish capital, free ransacking license, guarantee 100% satisfaction to everybody concerned. 1000 territories already assigned. Write today for your town. Hasty-Cake, A2367 Archer, Chicago.

EASY As pie to sell Chicago's best-selling cloth. Works like magic. Everybody buys. Big profits. Free sample. Write Christy, 4155 Lakeview, Newark, New York.

\$20 DAILY Easy. Auto seat and furniture covers. \$2.25 up. No competition. Free outfit. Quality, 1831 North Ave., Dept. 311, Chicago.

BLIND Women's needles, size 1 1/2, 10¢. Wm. Delaney, Yonkonia, Ill.

GENERAL Agents—New line food flavors, toilet preparations made under your own label. A hit! Write quick. Diversified Products, Box 628, Toledo, Ohio.

100% PROFIT in new "20-in-1" kitchen necessity. Retail 25¢. Costs you \$1.00 a dozen. Sample for in your risk of nothing. New Method Co., New-Method Bldg., Desk PM3-A, Bradford, Pa.

START Business yourself. Tested formulas; catalog free. This month's special—"Polystateline" polishing cloth formula \$1.00. Grinstead, Chemist, Edinburgville, Illinois.

PORTRAIT Men! We insure your sales and arrange for delivery and collections. An absolutely new hot-hot proposition that is selling over big even in these times. Big commissions! Crew managers investigate. Write or wire at once, territory being closed fast. J. D. Keating, Salesmanager, G-36 E. Randolph, Chicago.

NEW Discovery. Washes clothes without rubbing. Cleans everything. Sells 25¢. Profit 17¢. Sample free. Room, 4215B Irving Park, Chicago.

"POWDERED SILK" America's best hand cleaner sells fast to everybody. Removes grease, stains, ground-in dirt. Big profits. Sample free. Adams Manufacturing Co., Dept. A, Boone, Iowa.

MEN—Women \$3 to \$8 daily. Selling 25¢ household necessity that repeats. Three to ten sold in every home. Free sample. Write Pure Company, Dept. H-251, 3147 Pine St., St. Louis, Mo.

HIG Profit putting our genuine gold leaf stain letters on store windows. Experience unnecessary. Samples. Consolidated, 49-T West Vanhook, Chicago.

NEW Changeable silk sells to stores for \$1.50. Agent's profit 300%. Particulars free. National Sign System, St. Louis, Mo.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

AGENTS For handkerchief; original powdered handkerchief. Approved. Good-Housekeeping. Everybody's customer. Fine opportunity for hustler. Sample free. Solar Products, 1-214 So. Tru, Chicago.

OUR Free gift deals with our toilet goods assortments, food products, polishes, etc., get the business. 150 repeaters—100% profit. Also cash prizes to best producers. E. M. Davis, Dept. 260, 560 Randolph, Chicago.

EARN Extra money at home. No running. Harvest, 492 Garden, Hartford, Conn.

RAZOR Blades, hollow ground, improved double edge, ten cent packages, ribbed, easy selling. Sold everywhere. Standard Safety Razor, Pittsburgh, Penna.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

"ANTI-STEAM" Keeps windshield clear of steam, frost, rain, snow. Remarkable seller. Exceptional opportunity. Free sample proves this. Walter S. Doe & Co., Kent, Ohio.

SELL Stoves, carded razor blades, etc. Loran Products, Albany, N. Y.

FREE "Booklet" describes money making opportunities, new ideas, original plans, money making secrets and other valuable information. None require peddling or outfit. Little Co., 81 Elizabeth St., New York.

ANYONE Can make signs with the easiest sign letters on the market. Real paid. No brush necessary. Free sample. "Haley," 1015 Washington, Boston, Mass.

A BUSINESS Of your own—Making sparkling glass name and number plates, checkboard signs. Big book and sample free. E. Palmer, 512, Waver, Ohio.

AGENTS—Clever, Inventive! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

AGENTS Everywhere making money with our line of kitchen specialties, demanded in all homes. Big earnings possible. Write today for details. P. Seed Filler Co., 353 Broadway, New York.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

FREE "Booklet" of money making opportunities, new ideas, original plans, money making secrets and other valuable information. None require peddling or outfit. Little Co., 81 Elizabeth St., New York.

MIRRORS Restored at home. Costs near 5 cents per square foot, you charge 75 cents. Profitable business; plating apparatus, reflectors, tableware, stoves, refinishing materials, etc. Outfit furnished; details free. Write Sprinkle, Plater, 128, Marion, Ind.

POLMET Polishing Cloth removes tarnish from all metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Details 25¢; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Mass.

PHOTO Machines men and women, the largest line of photo necessities in the world. Lowest prices, quickest service. Send for catalog showing over 300 money makers. Edison Photo Jewelry Co., Inc., 620-640 Grinstead Ave., Brooklyn, N. Y.

PROFITABLE Home business. Legitimate. No canvasser. Maynard Publishers, P-923 Broadway, New York.

WOULD You like to make \$10 to \$15 a day selling our line of toilet preparations? We want agents in every town; men, women, students; whole or part time. Write for free sample outfit offer. Hinds Perfume Co., 515 E. 47th St., Chicago, Ill.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish bells, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and profits. Gun Metal Co., Ave. H, Decatur, Ill.

HIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.15. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name and address. 25¢. Stamping outfits, Emblem checks, check-books, name plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

REPLATE Brass worn-off automobile parts, reflectors, bath room fixtures, worn spurs, forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury; \$1.00 half price. Postpaid. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

SOMETHING The housewives want. A signed guarantee to save money and time in cooking. No competition. 40% profit. No license required. Station 4, Box 215, San Diego, Calif.

AGENTS—Engraved name plates, signs, number plates etc., readily sold with large profits. Best Brass, Wingham, Mass.

CALIFORNIA Perfumed brands, selling like hot cakes. Agents rolling money. Catalog free. Mission Factory, P. 2378W Pine, Los Angeles, Calif.

THIS Advertisement may make you thousands of dollars. If you write immediately for my "Eye-opening" literature describing guaranteed formulas; valuable trade processes, money-making information how to easily make the world's best-selling specialties. All lines. Investment small. Profits immense! Start in your home, room or office. Make the good money you're entitled to. Dr. Lacombe Miller, Chemist, Tampa, Fla.

WE Start you without a dollar. Soap, extracts, perfumes, toilet goods. Experience unnecessary. Carnation Co., 631, St. Louis, Mo.

SELL Men's neckwear—wonderful proposition. Assoc-M, 30 East 28th, N. Y.

FLAVORING Extracts—Bottle yourself! Labels furnished. 800% profits! Whirlwind money-makers! Repeaters! Free offer. Thomas Manufacturing Company, Indianapolis, Ind.

100 THICKS You can do—Divulge your friends; have loads of fun. This collection of tricks has been selected by Thurston for the average person. Neither unusual skill nor elaborate apparatus are required. Send for this 200-page illustrated book. Pay postman, \$1 plus postage when delivered. If outside U. S. remit when ordering. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN WANTED

BUILD A route of satisfied steady repeat customers with the only genuine California grape brick and orange brick. One brick makes one gallon juice, all flavors, (apple, cherry, champagne, orange, lemon, etc.) Every home, hospital, pharmacy, grocer, druggist, prospect. Take orders, give service, build up trade, 100% and more profit. Our business was booming during depression year. Between cheap imitations flooding country since our product received nationwide publicity. Locality twice successfully tested in Federal courts. Van Sana Co., Dept. S-228, San Francisco, Calif.

LOCAL County manager to service exterminators now in use and demonstrate new patented device for schools, homes, stores, shops, garages, churches, warehouses, trucks, autos and buses. Our men are earning from \$35 to \$50 weekly on service work alone in addition to profits on sale of new equipment. Lifetime job for men who are reliable and ambitious to build up steady business. Successful men earn from \$3,500 up to \$10,000 a year. Large manufacturer with "A-1" rating. The Fyr-Peter Co., Dept. 3, Fyr-Peter Bldg., Dayton, Ohio.

SKILL 2-Pants sells \$21.95. You can make \$4 an order. Pure wool fabrics. Calumet Bldg., Fine tailoring. Union label. Guaranteed satisfaction. Many repeats. Sample suit. Big sales outfit free. Write Dept. P-16, Marline Tailors, 273 Seventh Ave., New York.

PLENTY New and different—Fast selling 5¢ and 10¢ merchandise on attractive counter cards. 100% comm. for you and dealers. Advertised by radio. No investment required. Catalog free. (Estab. 1921.) World's Products, 190 Central, Spencer, Ind.

MANUFACTURER Wants local representative line shirts, ties, underwear, hosiery; exceptional values, maker to wearer, large earnings daily. Extra cash bonuses regularly. Free shirt, tie. We start you without investment. Thousands successful. Expensive outfit free. Write Dept. 103, Roswell, 1237 Broadway, New York.

BUSINESS Stationery. Largest line. Highest quality. Quickest delivery. Biggest commissions. Homes. Free copyrighted cuts. Experience unnecessary. Outfit free. Williams, 2130 Alhambra, Dept. 537, Chicago.

\$135.00 COMMISSION From \$6.95 sale! You can make \$3 sale daily. Our salesman do it. Free kit. Sales Stimulators. Dept. 12H, 4811 Ravenswood, Chicago.

SALESMEN—At last! New feature sells punchboards everywhere. Dealers will with 100—prosperity back again. Profits enormous. Samples free. Puritan Nov., 1497 Jackson Blvd., Chicago.

\$18 TO \$25 Daily; biggest selling line of men's suits. Meet present day conditions. Amazing values at \$11.95, \$11.50, \$10.95, \$10.05. Also raincoats, slippers, neckties and inner suits. Biggest commission paid to advance. Liberal bonus. Free outfit. State age and selling experience. "Hoe" Foster, Inc., Dept. 23, 2250 South Spaulding Ave., Chicago.

SALESMEN Represent manufacturer direct to wearer. Sell guaranteed all wool suits, raincoats, \$18.95. You can make \$5.00 an order. Fabrics from America's finest mills. Union tailored. Satisfaction guaranteed. Outfit free. Write your experience. 331 Wood, Dept. 103, 800 B'way, New York City.

SALESMEN—Rubber stamps, accessories. Wonderful sideline. Central Stamp Co., Burlington, Iowa.

SALESMEN Sell Dump-O, only dust mop cleaner on market. Twenty million homes need them. Sund Mop & Broom Cleaner Co., Santa Rosa, California.

100% Representative wanted for large manufacturer, maker to wearer line shirts, ties, hose, underwear below store prices. Sensational free offers bring easy orders. Big cash commissions. Free shirt, tie offer, cash bonuses. Outfit free. Write Dept. 33 29, Albert, 800 Sixth Ave., New York.

GOOD Paying job open as local representative, old successful manufacturer selling direct to wearer. Sensational values pants, breeches, overalls, shopcoats. Largest line in field. Belt free with every 3. Big cash commissions. Outfit free. Longwear, Dept. P3, 389 Broome St., New York.

TRY Priced 5,000 men in good paying jobs, selling shirts, ties, hosiery, underwear, work shirts, suede shirts, etc. I'll give you a marvelous outfit free. Remarkable values get orders and repeats. Big cash commissions and bonuses. Write Dept. H3, Quaker, 1107 Broadway, New York.

MANUFACTURER of plastic leather wants distributors and agents. Business thrives on depression. Will finance responsible parties. E. Parker, Pierce Ave., Salem, Mass.

WOLFE'S Best razor sharpener (new). Attractive display cards. Quick sales everywhere. Big profits. Repeat protection. Particulars, sample 25c. Burnishart, 128 South Michigan, Chicago.

SELL Carried razor blades, aspirin, violet breath gum, shoeing machine, polishing cloths, shoe laces, handkerchiefs, rubber goods, etc. Large line. Big repeat profits. Attractive displays. Superior Company, 8203, Baltimore, Md.

MARVELOUS New changeable price cards; sell all stores. Rotherford, Lakewood, Ohio.

FLAVORING Extract sensation. \$1.00 vanilla, \$1.00 lemon, 60c almond, 60c maple, \$2.20 value in attractive sample case 50c. Your profit 50c. Every home uses. Sales easy. Order C.O.D. Cream Folks, St. Paul, Minn.

AMAZING Tailoring values pay you up to \$60 weekly. Virgin wool 2 pants suits \$17.50. \$5.00 profit. Union tailored. Leads furnished. Sample suit to producers. \$25.00 outfit free. Williams Bros., 829 Broadway, Dept. W-22-P, New York.

CAN You sell \$1.00 worth toiletries for \$1.00, giving ladies hair free with each purchase. Paris Laboratories, 5145 Leavitt, St. Louis, Mo.

100% PROFIT Sell garage, service stations. Zell Company, 1505 287, Pleasant Ridge Station, Cincinnati, Ohio.

SALESMEN! Twenty-three-year-old progressive salesman and advertising specialty house has need for five salesman with proven sales record on liberal commission basis. Write fully. Klein Advertising Co., Dept. B, Quincy, Ill.

CANVASSERS—Crew managers—Add-A-Wiper promises to be the largest selling automobile item of the year. Sells itself on demonstration. On ten persons without cost. 100% profit. Send 25 cents for sample and details. Money refunded if sample is returned in ten days. Dept. 3, Add-A-Wiper, 142 So. Portland Ave., Brooklyn, New York.

BIG Money selling shirts, ties, underwear, dresses, hosiery, pajamas, coveralls, pants, belts, play suits. Sales kit free. Nimrod Co., Dept. 05, 1022-38 Lincoln Ave., Chicago.

\$15.00 DAILY Selling Union Label business stationery, \$2.10 per 1000; cards and blotters 1000 for \$1.50. Free col. service. Big commission. Large profit. National, 108-28 N. Jefferson, Chicago.

DISTRIBUTORS. Salesmen, agents—Earn 40% selling our 25c pocket cigarette roller direct or 100% selling dealers. Sample 25c, H. P. Mfg. Co., 2383 Carnegie, Cleveland, Ohio.

\$3.00 CASH Every time you sell \$22.50 all-wool, tailored-to-order suit. Amazing values. Greatest money-making opportunity. Beautifully styled garments quickly attract orders. Large swatch samples furnished free. Pioneer Tailoring Co., Congress and Thurgood, Dept. Q-1117, Chicago.

SALESMEN. Trade. New idea. No competition. Perfect car protector. 100% commission. Exclusive. Sample, particulars 25c. 171 E. Market, Long Beach, Calif.

IMITATION Ice cream. Amazing new product. No freezing. Made at home in 2 minutes. Solidifies milk into delicious dessert; 8 dish sample with money-making plan 25c. Dreamland Co., St. Paul, Minn.

SALESMEN \$2.98 Old Hickory work shoe. Direct to wearer. Patented non skid sole. Amazing seller. Free sample. Aschil Shoe Co., 1050 West Newton, Mass.

MAKE \$150.00 per week? New legal saleshead plan. No investment to anyone. Season starting. Act quick! A&N Novelty Co., 661 Washington, Chicago.

BIG Profit putting our genuine gold leaf sign letters on store windows. Experience unnecessary. Samples. Consolidated, 60-V West VanDuren, Chicago.

PREMIUM Salesmen—Brand new trade stimulator appeals instantly all lines retail business. Just what you always wanted. Big commissions. Well tested company. Outfit free. Salesmanager, 4th Floor, 308 North Michigan, Chicago.

SALESMEN—Four \$15.00 sales to stores net you \$48.00 daily. Savers Systems, Ltd. 1885, 2801-123 Sheffield Avenue, Chicago, Illinois.

SALESMEN-DISTRIBUTORS. New auto tire patch; guaranteed 10,000 miles. Repairs blowouts permanently. Sells garages, gas stations, tire shops. Salesmen's profit 100%. Up to 300% to dealers. Easy seller. Exclusive territory. Economy Rubber, 608 Buckhardt, Dayton, Ohio.

FREE Booklet describes 87 plans for making \$20-\$100 weekly in home or office business of your own. Elise Co. 81 Elizabeth St., New York.

SALESMEN—Become independent. Own your business; experience unnecessary. Selling our \$10,000 accidental death; \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited. Insurance Department, Universal Policy, Dept. A, 716 Lefcourt Bldg., Newark, N. J.

WONDERFUL Opportunity. Twenty dollars per day can be earned. Experience unnecessary. Home protection at cost. Ages one to eighty. \$250 to \$1000 at death. Not insurance. You make \$5 for each member secured. Children of Virginia, sent in 51 non day. National Aid Society, Myers Building, Springfield, Illinois.

PENNY Gaffer, new fascinating coin-controlled game. Legal. Exciting. Merchants everywhere buy. Splendid commission. Specialize Bure, 617 Division, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Power cleared \$4000 in three months. Write, F. E. Armstrong, President, Dept. P3d, Mobile, Ala.

SALESMEN! Be successful. Get the Montgomery sales formula, a valuable aid to selling and other help from "What a Master Salesman Should Know," by L. L. Montgomery. Price \$2.50. Sent postpaid upon receipt of price or C. O. D. anywhere in U. S. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago.

HELP WANTED

AMAZINGLY Simple spare-time business. Big profits. No risk. Your home is your office. If you want to make real money, here's your chance. Full details free—write quick. Albert Mills, 1347 Monmouth, Cincinnati, O.

CASH Paid for butterflies, insects. See Similar Display Advertisement on page 12.

AMAZING New electric trouser press good for \$25 daily; puts razor edge in pants in 10 seconds, sells for \$2.50; your commission \$1.00. Sample kit packet. Munny Mfg. Co., Dept. C2C, 817 Main St., Cincinnati, Ohio.

AGENTS—Most corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 201 Scarle Bldg., Rochester, N. Y.

BOY Mechanic—Famous library of 4 volumes covers the building of everything a boy might want to make. A great boon to parents and teachers. Actually covers 4000 different articles. Each volume 460 pages, fully illustrated. Cloth. Price \$2.00 or set of 4 vols.—\$7.00 postpaid upon receipt of price or C.O.D. anywhere in the U. S. A. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago.

EDUCATIONAL AND INSTRUCTION

GREGG Shorthand 25c week, guaranteed; sample 10c. Haeuser, Norman Road, Newark, N. J.

GAIN Word mastery—new system. Speak effectively, write convincingly. Free particulars. Spreen, 5108-W 18th, Clero, Ill.

WORK For "Uncle Sam." Steady. \$100-\$250 month. Men-women. 15-50. Paid vacation. Short hours. Common education usually sufficient. Experience unnecessary. 25 coached free. Full particulars and list positions free. Write today sure. Franklin Institute, Dept. N3, Rochester, N. Y.

LEARN Photo-engraving at home by experience. Equipment furnished. Earn while learning. Aurora Photo-Engraving School, Aurora, Mo.

BECOME A landscape architect. Unexcelled profession; wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Est. 1918. Write for details. American Landscape School, 7 Plymouth Bldg., Des Moines, Ia.

PHOTOPLAY Talking picture and magazine stories wanted for revision, development and copyright. Sell on commission. Established 1917. Booklet free. Universal Scenario Company, 408 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

WANTED. Men-Women, 18-50, qualify for steady Government jobs. Salary ranges, \$105-\$250 month. No Government experience required. Paid vacations. Common education. Thousands appointed yearly. Write Quaker Institute, 181, St. Louis, Mo., immediately.

U. S. GOVERNMENT Wants men, \$1,000-\$1,000 and up at start. Railway mail clerk examination coming. Let our expert former government examiner prepare you for this and also rural carrier, post office, customs, internal revenue, and other branches. Write today for free booklet. Dept. S, Patterson School, Rochester, N. Y.

DON'T Prepare for any civil service examination without seeing our catalog. Free. Columbia Correspondence College, Washington, D. C.

SOUND Motion picture engineers wanted. Learn to operate. Free practical training when course is completed. Easy terms. 50% of tuition payable when employed. 103 North Ryan Ave., Dept. A, Los Angeles, Calif.

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, blues, pastes, medicines, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, esterolizing varnishes, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, raffles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. Just write for "Scientific American Encyclopedia of Formulas." When postman hands you book pay \$5.50 and postal charges. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago, Ill.

SHORT STORIES

SHORT Stories revised, typewritten and marketed. Details free. Hursh Service, Box P-1013, Harrisburg, Penna.

HISTORICAL—Something New—4000 years of history on a single page. A chart in 8 colors presenting a continuous, un-indicated record of events and characters of history from 2000 B. C. to date. Size 12x54 inches. Price \$1.00. Should be in every school and home. Sent postpaid upon receipt of price or C. O. D. anywhere in U. S. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago.

TYPEWRITERS AND SUPPLIES

TYPEWRITERS—All standard makes. Lowest prices. Catalog free. Northwestern Typewriter Exchange, 6-121 N. Francisco Ave., Chicago.

ALL TYPEWRITERS. Adding machine ribbons 50c, \$1.75 doz. O-Kay Ribbons Co., Box 137, Burlington, Iowa.

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(2) No liquid adhesives such as glue, shellac, cements, etc., may be used.

(3) Carvings or models submitted must not be painted or silvered or gilded, and will remain the property of Popular Mechanics after the contest ends.

(4) Awards will be made as follows for the best or most unique models or designs submitted:

First Prize	\$250
Second Prize	100
Third Prize	75
Fourth Prize	50
Fifth Prize	25

Also there will be twenty-five \$10 prizes and fifty of \$5 each. In addition, 1,000 special jackknives will be distributed to all winners of cash awards and to those receiving honorable mention.

The contest will close on July 1st, 1932, but models should be submitted as soon as possible. Awards will be made by a competent board of judges, and in case of ties, duplicate prizes will be given. The judges' decision will be final in all cases.

Models, which may be of any size, must be shipped in strong wooden boxes, as Popular Mechanics cannot be responsible for breakage due to improper packing. Employees of Popular Mechanics and members of their families are not eligible for prizes.

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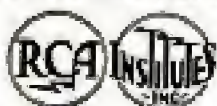
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After returning from overseas military service, Mr. Thompson, then in his early thirties, enrolled for a course with the International Correspondence Schools. Here is what he says:

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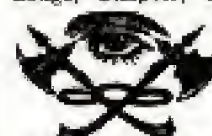
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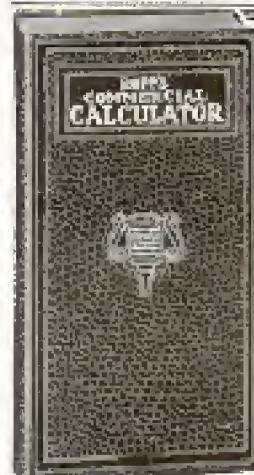
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Vol. 57

MARCH, 1932

No. 3

62543



Steam Multiplane Weighing 8,000 Pounds, Built in 1894 by Sir Hiram Maxim at Cost of \$200,000; It Was Wrecked in Its First Test

The Silent Air Liner

By HIRAM MAXIM

(AS TOLD TO JOHN R. COGGSWELL)

16 Edgewood Road,
Belmont, Mass.

MOST persons have the idea that the greatest part or all of an airplane's terrific noise comes from the engine exhaust. If this were so, all modern airplanes would be silent now, for, several years ago, I perfected an exhaust silencer that eliminates this noise and sets up no back pressure. The device is inexpensive and weighs only about twenty pounds.

The reason such silencers are not part of the equipment of all planes today is that this noise constitutes less than a third of the din that comes from an airplane in flight. It is easy to stifle the exhaust noise, but the sounds from other sources have proved exceedingly difficult to silence. To understand the problems in-

volved, it is necessary to consider some of the ways in which sounds are created. Any movement of any body through the air causes a sound. Even a wave of the hand makes a noise, though this is too soft to be heard by the ear. The faster the object moves, the louder the noise.

A golf club makes an audible swish as it is swung on the ball; a whip makes a more pronounced swish, for it can be moved faster. If the movement is faster than the speed of sound in air—1,100 feet a second—the noise becomes very loud. For instance, the lash on the end of a whip concluding a swing at 1,101 feet per second, gives a loud crack; the crack is absent when the movement is but 1,099

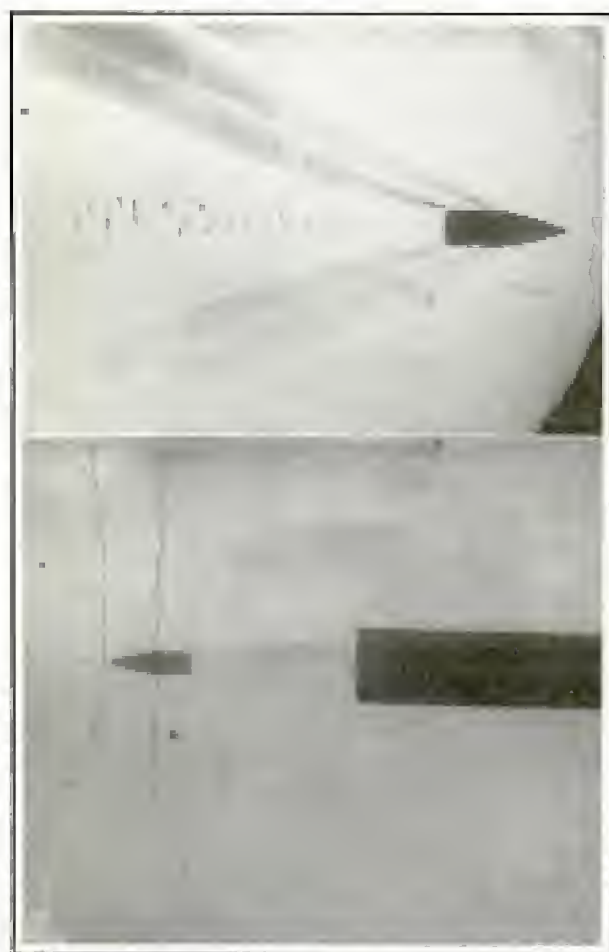
feet per second. Why does an object moved through the air make a sound? Because it compresses the air before it. This compressed air expands back to nor-



mal pressure just as suddenly as it was compressed; the expansion sets up a movement of the atoms of the atmosphere and the impinging of the moving atoms upon the eardrum makes us hear the sound.

We have actually taken photographs of the sound waves created by a rifle bullet flying through the air, a sound that is absolutely distinct from that of the powder explosion. This is possible because light rays passing through a segment of compressed air are refracted and registered upon a fast photographic plate. The pictures were made with an exposure of one-millionth of a second.

Now consider the tip of an airplane's



Top, Photo of Sound Waves from Speeding Bullet; Below, Bullet after Passing through Silencer



Hiram Maxim Making First Tests of His Famous Gun Silencer with an Army Rifle

eight-foot propeller, turning at 1,800 revolutions per minute, or thirty a second. The speed of the propeller tip is not faster than sound, but it is amply fast to create a pretty loud noise. Its velocity of 754 feet per second is getting up fairly close to the speed of sound. If the tips traveled faster than sound, no human could stand to be in or near a plane. Naturally, then, the whirling blades create considerable noise; in fact, nearly one-third of the total sound produced by the machine.

Fortunately, it is not necessary to have the propeller turn as fast as 1,800 revolutions a minute during flight; an airplane, once it is off the ground, travels just as swiftly and functions much more efficiently with the propeller's speed cut down considerably. Already, an airplane has been fitted with gears, enabling the pilot to cut down the speed of the blades. This practically eliminates the noise and, at the same time, increases the efficiency of the craft.

The third source of noise is due to flutter, an inherent characteristic of any object moved rapidly through the atmosphere. At first thought, one would imagine that a flag flying in a strong, steady breeze would stand out from the staff motionless. But we know that a flag in moving air always flutters and that flutter sometimes makes quite a noise.

The blades of a propeller move in a veritable super-hurricane, and the passage of the airplane through the air sets up a

continuous flutter in all parts and that makes a lot of noise.

The fact that devices which will eliminate the flutter noises are still on their way through the patent office, makes it impossible to give a detailed description at present. However, it can be stated that the creation of air foils before the propeller and other of the worst-offending parts, has successfully done away with this source of noise. Silencing the exhaust, the propeller blades and the flutter, completes the job, as far as the person outside of the plane is concerned.

However, other things are necessary to make travel in a cabin plane absolutely comfortable. The building of a sound-proof cabin is already an accomplished fact. The walls are lined with sound-absorbing materials, and the windows are double and made of small laminated panes, of three layers—two layers of glass with an intervening layer of celluloid.

Finally, the ventilator silencer, announced a year ago for shutting street noises out of buildings, has been modified for use in plane-cabin ventilators. Two intake ventilator silencers will be installed in the forward end of the cabin and two outlets, of the same construction, toward the stern. That airplane will be soundless to the person on the ground, and in it the passenger will be able to read or carry on a conversation with the same ease as in his own home.

MIRRORS ON AUTO LIGHT BULBS ELIMINATE GLARE



Headlight bulbs on automobiles can now be fitted with mirrors which eliminate glare, dimming or tilting, and also make night driving safer, particu-

larly in fog, snow and mist. The device consists of a condensing mirror fastened to the top of the bulb at an angle. By reflection from the lighted bulb filament the efficiency of the bulb is increased. The upper flange of the attachment casts a shadow on the upper sector of the headlight, which eliminates glare.

Marwhite Corp.

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Machine Prints Facsimile of Payee's Signature on Face of Check



SIGNATURE STENCIL FOR CHECK GUARDS AGAINST FRAUD

By stenciling the payee's signature on the face of bank checks, business houses and banks hope to prevent payroll padding and other forms of fraud. A device for doing this work is an adaptation of stencil and ink rollers. The signature of each employe of a company is obtained upon a stencil sheet. When the payroll checks are drawn, each stencil is fitted upon a check blank bearing the usual printed matter and having a proper space to receive the stenciled name. Then check blank and stencil are passed through a machine so that ink penetrates the stencil and leaves on the check a facsimile of the payee's signature. When the check is cashed, the indorsement can be readily compared with the stenciled signature.

PLANT WARNS OF GAS DANGER

Growing an ordinary tomato plant in your home may be the means of saving your life, for it has been found that this plant is very sensitive to asphyxiating gases. A mere trace of illuminating gas, for instance, is enough to cause the younger leaves to droop. It would be difficult to find a better test for gas leakage which may be imperceptible to humans.

Experiment of Prof. Carl U.

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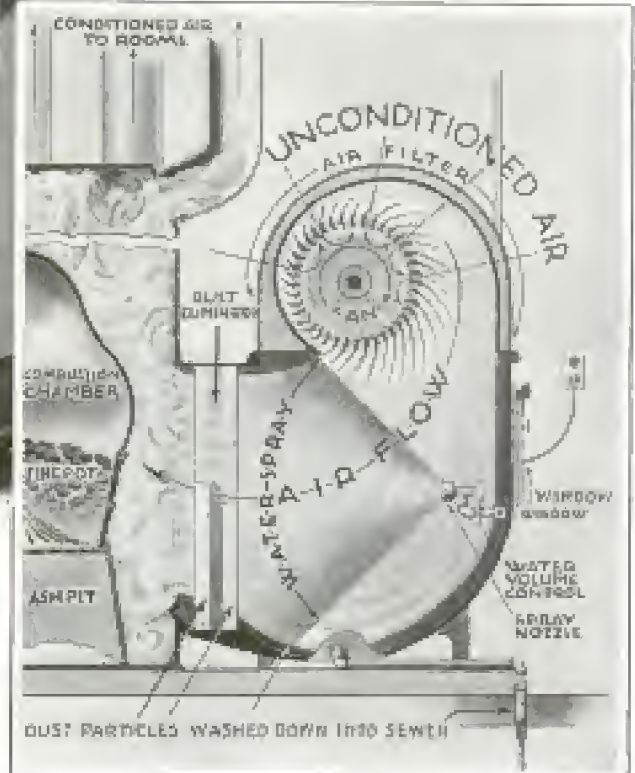
Holland Furnace Co.) no export business
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356

POPULAR MECHANICS



cupying about ten square feet of floor space. Air first passes through a filter which removes much of the dust, then, forced by two fans, it is drawn through swirling water sprays. After its "laundering," the air passes through the furnace casing, where, in winter, it is warmed for the house. If the heating plant is not



Air Conditioner for the Home That Heats or Cools the Flow; at the Right is Seen a Phantom View of the Apparatus, Showing Details of Operation

WEATHER FACTORY FOR HOME HEATS OR COOLS AIR

Air is heated in winter, cooled in summer and washed and circulated at all times by a home "weather factory" now available to the average family. Yearly comfort and health, with marked savings in fuel and economy from dust elimination, are claimed with the apparatus, which can be employed in connection with any type of heating plant. The entire outfit is simple and has few parts to service. It looks like a metal cabinet, oc-

of the warm-air type, the weather factory is installed as an independent auxiliary. Humidity is provided by the adjustable water sprays. In summer, when there is no fire in the furnace, the air is cleaned and cooled by the sprays, and in extremely hot weather refrigerating units can be installed.

RIGHT FOOD ENDS TOOTH DECAY IN TESTS ON ANIMALS

For the first time in history, a way to prevent tooth decay has been found. A method effective on animals need only be applied to human beings to end rotting, decaying and infection of teeth. Drs. E. V. McCollum, Henry Klein and H. G. Kruse, after ten years' work, discovered that the quality of the saliva is the im-

portant thing in determining whether teeth will decay and that quality depends upon the chemical composition of the blood. The proper foods will put into the blood those things necessary to keep teeth in healthy condition. A certain proportion of phosphorus will keep the saliva at the right state between acid and alkaline, acting as a buffer solution. In addition, calcium and phosphate are necessary to preserve the enamel. Foods such as milk,

Prof. of Biochemistry John
 Hopkins School of Hygiene and
 Public Health, Baltimore Md.

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eggs, lean beef, beans and peas are rich in phosphorus. Calcium-rich foods are milk, eggs, watery vegetables, especially spinach, lettuce and cabbage, and some fruits. Vitamin D, the third substance for keeping teeth healthy, is present in fish oils, egg yolk, butter fat and whole milk.

MASONRY TRESTLE BUILT WITHOUT FORMS

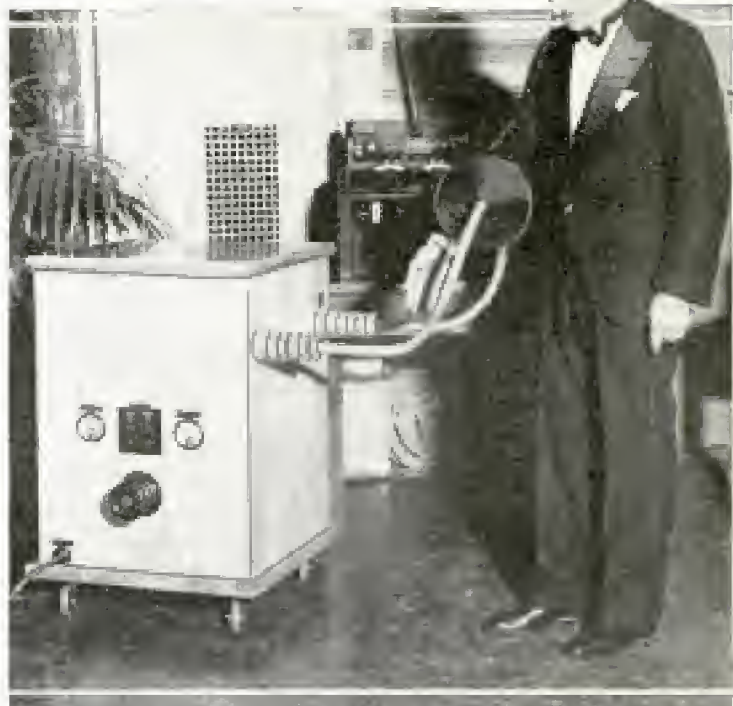
Q 2528
Built entirely of brick, reinforced with steel rods, a railway trestle, 293 feet long, has been completed in Illinois by two bricklayers, working fourteen days. The bridge has twenty-one piers, each with a flat arch at the center. Steel rods were placed in the mortar joints to give the structure tensile strength, and the piers were reinforced in all directions. Sleepers and tracks were laid immediately after the brickwork was finished and the trestle put to use at once. No special shapes or sizes of brick and no forms were required. Research has shown that the structural strength of reinforced brick is amazing. Beams, twelve feet long, have carried as much as twenty-two tons without breaking, and slabs, eight feet long and only three and three-fourths inches thick, 1,000 pounds per square foot.



Railway Trestle Built in Fourteen Days of Steel-Reinforced Brick; There are Twenty-One Piers

*Industrial Track Trestle
Wedron, Ill.*

Applying the Principle of Short-Wave Radio. This Fever-Producing Machine Is Used in Treating Rheumatism and Similar Ills



HEAT APPLIED TO RHEUMATISM BY SHORT-WAVE RADIO

Ac me
Treatment of rheumatism and other ill with heat has been advanced by the introduction of a portable electric fever-producing machine constructed on the same principle as the short-wave radio transmitter. The device makes it possible to raise the internal temperature of certain body parts—arm and leg joints for example—without producing a complete fever temperature. Heat ranging from ninety-eight to 105 degrees can be developed by the machine, which was produced by the General Electric company. The greatest heating consistent with the tube output has been obtained from the use of a thirty-meter wave, oscillating ten million times between the plates. The device, called a "radiotherm," has been used in giving more than 500 heat treatments.

OYSTERS FOR ANEMIA

Oysters are rich in iron and copper, providing a valuable dietary aid in preventing anemia. The copper is helpful to the fixation of iron in the blood, research workers of the Canadian department of fisheries have found. Some lately found vitamins also are contained in oysters.

*discussed before
Science Forum of New Orleans
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Build by Allen R. Page.

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U.S. Daily 12/16/31

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POPULAR MECHANICS

359

AUTOS OWNED ON THREE-FIFTHS OF AMERICAN FARMS

Fifty-eight per cent of the farms in the United States own automobiles, according to the census bureau. Figures for April 1, 1930, showed that thirteen and four-tenths per cent of the farms had motor trucks, slightly less than the ratio for tractors. In addition, four and one-tenth per cent of the farms have electric motors for farm work, while fifteen per cent have stationary gas engines. Nebraska has the largest percentage of automobiles, ninety-one and eight-tenths.

TRACTOR THAT DIGGS UP TREES AIDS NURSERY HARVEST

Trees up to twenty feet high are dug by a tractor recently placed on the market. The tractor straddles the row of trees, much like a potato digger, and penetrates the soil to a depth of sixteen inches. Tree stock is left in the ground, heeled and ready for lifting. The blade cuts a swath twenty-four inches wide and is quickly raised or lowered with little effort. The entire machine can be turned in its own length at the row end and an additional advantage is its ability to dig only part of a row of trees if it is desired to leave some.

Tree-Harvesting Tractor at Work in Nursery; Roots Are Cut and the Saplings Left Standing Until Ready to Be Lifted for Delivery



Electric Wheel Co.
Quincy, Ill.

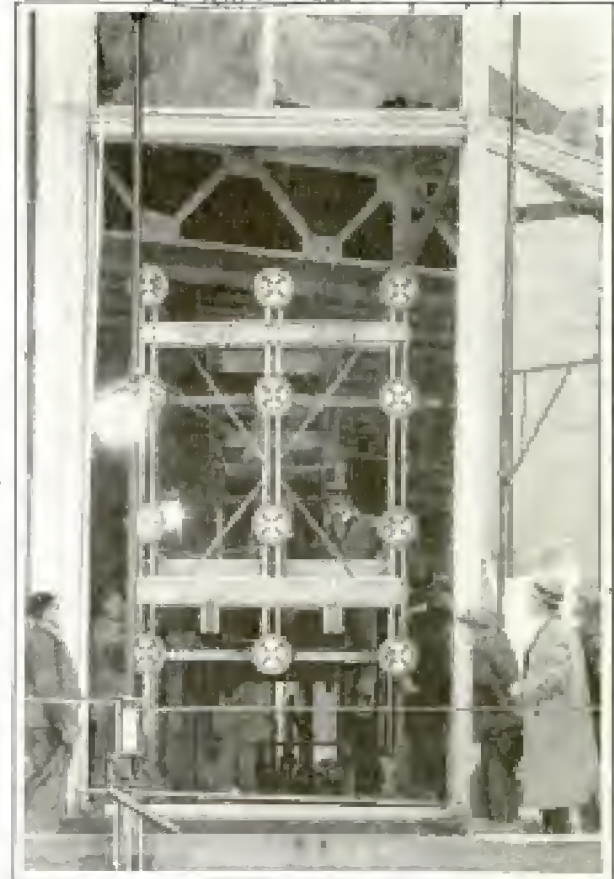


Plate Glass Being Raised into Position by Means of Vacuum Cups Attached to Metal Frame

BIG VACUUM CUPS RAISE GLASS WINDOWS INTO FRAMES

Large plate-glass windows are being lifted into frames and moved about by the use of big vacuum cups, the principle being the same as is employed in holding a match box to the windshield of a car by a small suction cup. The glass lifter consists of a frame containing twelve vacuum

cups, each one foot in diameter. These are set against the glass and a vacuum applied. By means of valve connections, each cup may be placed independent of the others. With such a device it is possible to place large glass windows on tall buildings in removable frames, swinging the glass in for cleaning with the suction lifter.

Moist balls have been found to check fungi and parasites that kill plants.

Wm. Freeman
Weir and Co.
Ranger, Pathological

U.S. Dept. of
Agriculture

And. H. Bangs, 121 Newtonville Ave.
Newton, Mass.



Controlled Heat, 1,000 Degrees Hotter than That Heretofore Found Practical for Commercial Purposes, Is Shown Being Applied to an Ordinary Electric Furnace

ROCKS AND WOOD TURN TO GAS IN ELECTRIC FURNACE

Rocks, wood and metals can be converted into vapor by a heating method in which an ordinary electric furnace is used. Heat of 3,600 degrees centigrade has been reached, pushing the limit for controlled heat up 1,000 degrees. While higher temperatures have been reached with furnaces of special design, this method is the first to make such heat commercially practical with a furnace of conventional design. One feature is that while graphite is being vaporized under 3,600 degrees heat inside, the outside of the furnace, three inches away, remains cool. Bits of wood apparently were converted into gas before they even entered the heating chamber. The gas thus formed, even from a small piece of a quarter-inch cube, was almost sufficient to blow the furnace apart. Ordinary rocks of silica or magnesium

base were turned into vapors which were expelled to burn in the air with the white flame of magnesium flash powder or silicon metal. Iron, which vaporizes at 2,400 degrees, seemed to form a carbide quickly, and as such was kept in the furnace until the heat was close to 3,600 degrees. At that point, a roaring blue and white flame rushed out into the air. In one case, the power was kept on too long and the vapors wrecked the furnace. Even greater heat may be reached.

Q 2547

COPPER MADE HARD BY ADDITION OF BERYLLIUM

Copper, alloyed with about two per cent of beryllium, has been shown, when heat-treated, to possess the tensile strength and hardness of good steel, while retaining all its particularly necessary qualities as copper. The development of the alloy has followed several years' experimentation to produce sufficient beryllium to make it commercially interesting. About the only source is the ore beryl, from which emeralds and other precious and semiprecious stones are obtained. The cost of beryllium, however, has now been reduced from \$150 to \$50 per pound and the alloy, with a content as high as twelve and a half per cent of beryllium is quoted at \$6.35 per pound. The alloys have very high electrical conductivity, cast with ease and possess great sonority. They are elastic, fatigue-resisting and non-corrosive. For the latter reason they are adaptable to the manufacture of springs in instruments and measuring devices. Included in the long list of prospective uses are valve parts, condenser tubes, propeller shafts, bearings and gears. Principal supplies of the ore are in New England and the far west.

Beryllium Development Corp. Port Huron, Mich. Copyrighted material

Q 2535
Electrothermic Corp. Trenton, N.J.
Grand 1. Electric, electrical engineering workshop under the Edison Hotel, Northampton, Massachusetts

NY Times R/17/31

ern states, sometimes as a by-product of mining mica and feldspar. Beryllium is one of the lightest metals known.

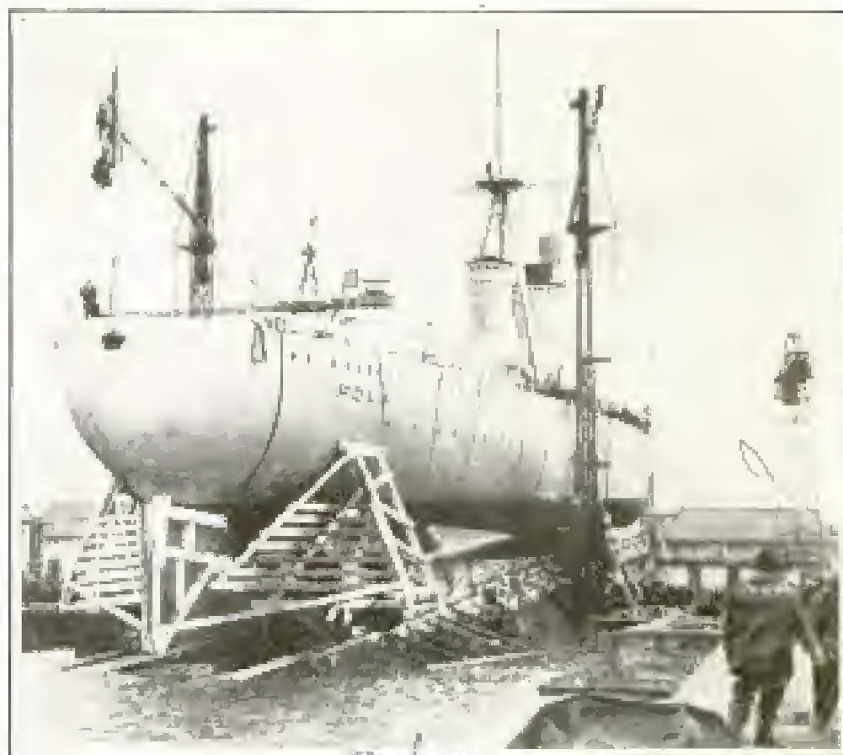
WHEELLESS TIRES "FLOAT" OVER BUMPS 22513

Smooth riding over railroad tracks, curbstones, deep ruts and chuck holes is claimed with a new type of auto tire that is fitted directly to an oversize hub instead of a wheel and operates on only twelve pounds of pressure. In cross section the new tire is triangular, like a pyramid with the apex at the bottom, making the base broad and the tread narrow. It is said to contain two and a half times the volume of air of the ordinary "doughnut" type at much lower pressure. As a result of the narrow tread there is no more rubber on the road surface than with the usual balloon type, while the almost straight side walls and broad base are credited with giving



Dreamline Jumbo
 Only Twelve Pounds of Air Are
 Required for These Tires

the car greater stability, safety in emergencies and easier steering. A "floating" ride is stressed as the principal result.



Pola
 © International News Photo
 Here Is Italy's Latest Cruiser, of the 10,000-Ton Peace-Treaty Type, Just Before Its Launching within a Year After Work Started

CRUISER BUILT IN RECORD TIME OF LESS THAN YEAR

Marking a record for construction in that class, a 10,000-ton treaty cruiser has been completed and launched by the Italian government. The keel was laid early in 1931 and the vessel was christened and launched shortly before Christmas. King Victor Emmanuel christened the cruiser, naming it the "Pola."

GOGGLES FOR GLASS BLOWERS TO IMPROVE WORK 22560

Lenses have been designed for goggles worn by glass blowers to eliminate the objectionable yellow glare from incandescent glass. When observing a piece of glass in the flame, the wearer sees only the red glow of the glass, with sharply defined outlines. Under usual conditions, the glass blower must frequently remove the work so as to note the exact shape of the glass. The new lenses are transparent to other light, making it practical to wear the goggles indefinitely, since they do not interfere with normal vision when looking for objects on the workbench. The lenses are pinkish in color, being constructed of special didymium glass.

Chicago 2247

Collage Line

Burgess, Parr & Co. Inc.

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A2527

CRYSTALS *that* TALK



Photo by
Fred H. Hill

"CLEAR as a crystal" will be no idle comparison for the voice of your radio or phonograph within a short time, now that a hundred years of study and research with talking crystals have yielded something more practical than a mass of figures and notes.

Radio loud speakers, phonograph pick-ups, microphones and other instruments working on a revolutionary principle are to be placed on the market soon. They will be of the simplest construction imaginable, their working parts being nothing more complicated than a piece of Rochelle-salt crystal.

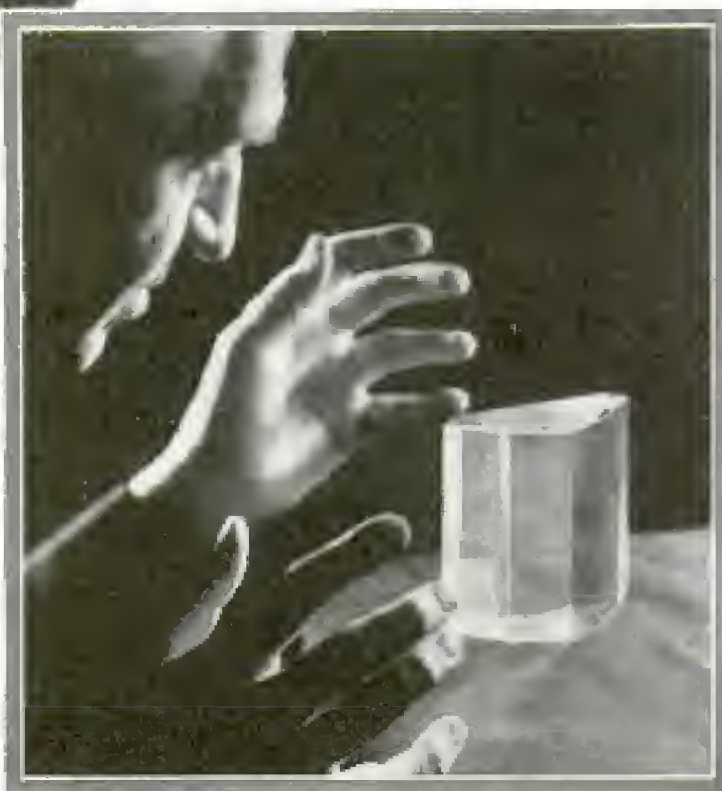
It remained for the Brush laboratories in Cleveland, headed by Dr. C. Baldwin Sawyer, to convert the Rochelle crystal that had been a scientific curiosity for years into something that can be used by you and almost everyone else.

Crystals of Rochelle salt, grown at the Brush laboratory to huge proportions by

a secret process, possess the peculiar property of giving off electricity when squeezed or caused to vibrate, and of changing their shape when subjected to electrical charges. This property of certain substances to produce or react to electricity is known as the piezo-electric effect.

During the world war, talking crystals were studied in an effort to devise a means of submarine communication at extremely high frequencies, above the range of human ears, so that both surface and undersea ships could talk to each other without enemy ears listening in.

Because Rochelle salt produces the best singing crystal, most of the development work has been done on that substance. These remarkable crystals are grown



Above, Dr. C. B. Sawyer of Brush Laboratories, Expert Crystallographer; Below, a Specimen of Cut Crystal

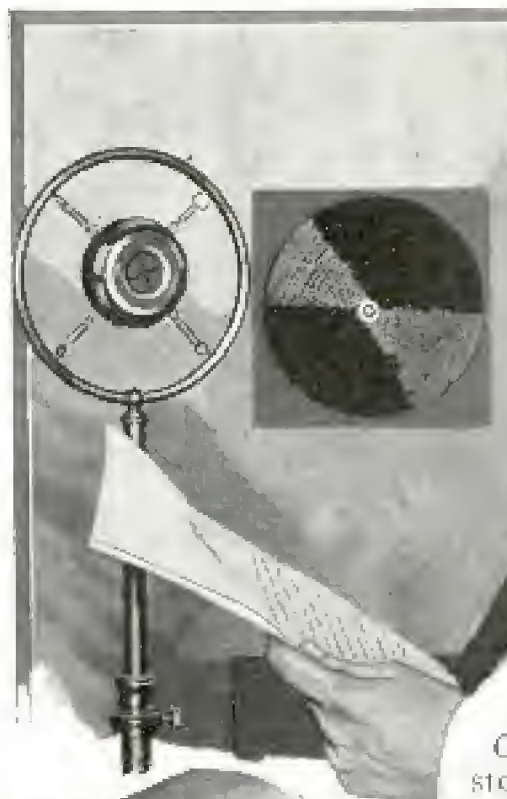
from a saturated solution of sodium-potassium tartrate. A Rochelle crystal must be squeezed in a certain way in order to make it act as an electric generator. The electricity is collected by plates of metal foil cemented to opposed surfaces, and to these plates the lead wires are attached.

3745- Crystals for Cleveland, Ohio - see July 19 38-90
3311- 25 Perkins are, Cleveland Q

and SING

A whole crystal is not used in a loud speaker, pick-up or other device. It is cut into plates or other forms, and these smaller pieces are used. If a rectangular plate of crystal is mounted so that one end is rigid while the other is free to move, and if an electric charge is applied to the two large surfaces through their foil covering, the crystal will distort in a certain direction. If the current is vibrating—as that coming from a radio receiver—the crystal will vibrate in unison.

Now, if the free end of the crystal is attached by a small rod of wood or other material to the apex of a speaker cone, and the two tinfoil plates connected to the speaker terminals of a radio-receiving set, the



crystal will convert the electrical impulses into sound which is magnified by the cone so that it is heard as music or speech.

One of the most important steps taken by Doctor Sawyer and his associates in the art of making crystals talk was the developing of a high-powered unit. A crystal plate moves in one direction only, when a certain electrical force is applied. Likewise, another plate will behave in the same way. Now, if these two plates are placed with two of their large faces together and arranged so that one will move in one direction and the other in an opposite direction, a unit much stronger than any single plate results. An arm can be attached to the moving end and to a speaker cone. It is this type of unit that is being introduced in the new crystal speakers. The diaphragm movement is as great as one-eighth of an inch for low musical notes.

Many radio speakers do not reproduce notes higher than about 3,500 vibrations a second. Some of the better ones go as high as 6,000. The Rochelle-salt crystal will handle a note of 100,000 cycles just as easily as the thirty-two cycle boom



Top, Latest Crystal Microphone with Crystal Loud Speaker in Background: Below, Trimming Foil Strips from Crystal Mike

Em. A. B. Bruce
1521 Minger St.
Houston, Tex.

POPULAR MECHANICS

364

of an organ pipe. In commercial types of crystal speakers, however, the upper limit

Assembling a Crystal Speaker Which Reaches High Frequencies



is not reached, because human ears seldom are responsive much above 20,000 cycles.

Because of the ease with which it reproduces high notes, a form of the piezo-electric speaker has been developed for use in conjunction with dynamics which handle bass notes better than high ones. This auxiliary unit has a cone smaller than the standard crystal speaker. It is likely, therefore, that radio receivers a year or two from now will be equipped with two speakers, to cover the entire music range completely.

This, truly, is a mystic crystal from which an untold number of wonders may be expected to come.

ELECTRIC "BOMB" KILLS MOTHS WITH CHEMICAL FUMES

Chemical fumes heated by electricity are used to kill moths in an automatic exterminator now on the market. When placed in a clothes closet, it will kill all moths and larvae and immunize the garments in twenty-four hours. Two chemicals, naphthalene and paradichlorobenzene, when heated by the electric unit connected to the



nearest wall socket, send out the fumes. Only a single ball is necessary for each closet, it is said.

RADIO BRINGS DOCTOR'S ADVICE TO PEOPLE OF FAR NORTH

One Ottawa, Canada, doctor probably covers more territory in treating his patients than any other physician, but he uses the radio instead of an automobile to make his visits. He is Dr. F. S. Parley, an official of the department of health, and all his diagnosing and treatments are accomplished by wireless. Dotted throughout the far north are small settlements of men and women isolated from civilization. When sickness adds to their loneliness, they appeal to the settlement radio station, and their symptoms are wirelessly to Doctor Parley who makes a diagnosis and flashes back a course of treatment. A medical manual, a first-aid kit and a cabinet of staple drugs are standard equipment at every government post. Doctor Parley has a manual identical with those at the posts. He radios the page number, and the patient follows instructions he finds there. When special treatment is required, the drugs are specified by the numbers of the vials containing them.

CAR SPEED RECORDED IN CRASH BY SPEEDOMETER LOCK

Speed of an automobile or truck at the moment it collides with another vehicle or object can be recorded automatically by a device which locks the speed indicator under a lateral impact. Called a "strikometer," it is intended to be a silent witness in accidents, a protection to the careful driver. The device is not actuated by the severest horizontal jolting such as might be received by traveling over a rough road or hitting a rut. It is built into speedometers during the process of manufacture and is provided with a seal to be broken only by authorized persons.



W. J. Abidine
1716 1/2 Colorado Blvd.
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Automatic Washer Co.
Newton, Iowa

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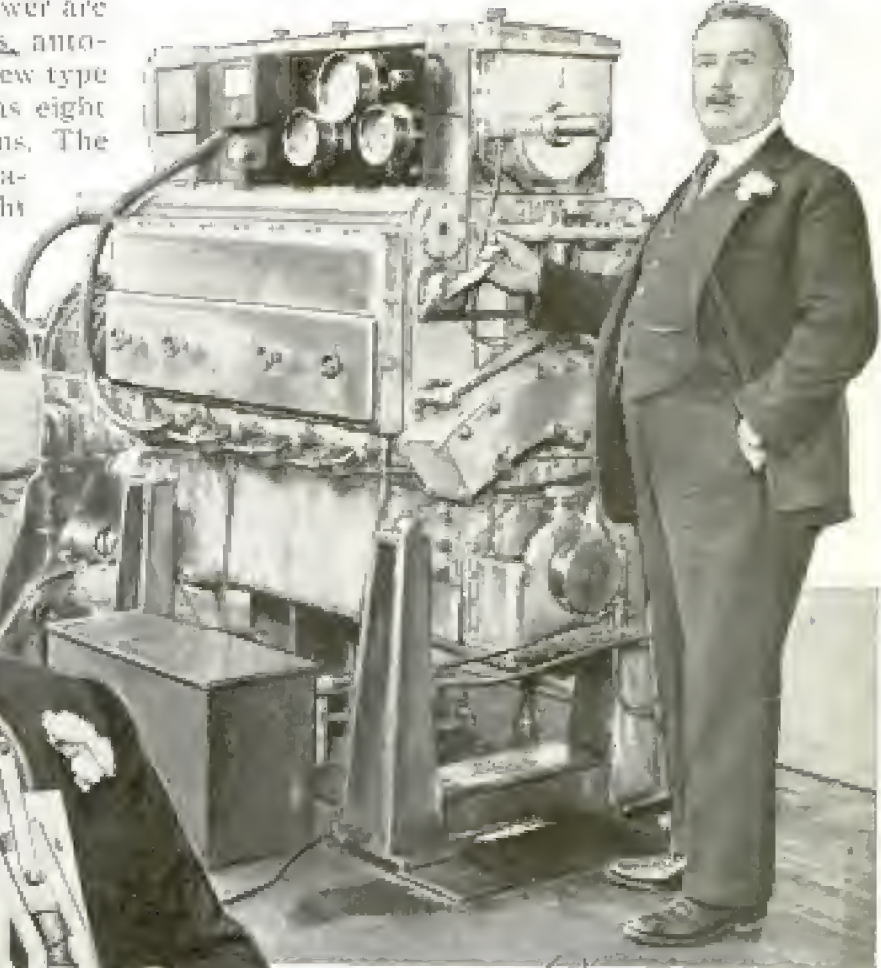
POPULAR MECHANICS

365

Cleveland Ohio

Auto Expert Spends Half Million on Diesel

High speed and high power are obtained by F. B. Stearns, automobile expert, through a new type of Diesel engine which has eight cylinders and sixteen pistons. The engine is shaped like a diamond, or like two "V" eight



Stearns

tual horsepower. One of its important features is fuel economy, consuming only .42 pound of fuel per horsepower-hour as compared with six-tenths pound, and more in the conventional gasoline engine. The fuel burned in the Stearns engine is furnace oil, purchasable at five cents a gallon. Mr. Stearns spent \$500,000 in developing the engine.

F. B. Stearns and His New Diesel. Above: the Inventor with a Cut-Away Model, Below

engines placed one above the other with the prongs of the vees in the middle. Combustion space is between the two pistons in each cylinder, the pistons being pushed apart on the power stroke. Thus a "cushion" is provided on the compression stroke, making for extreme smoothness. There is a crankshaft at top and bottom, the two being geared together. Except for the two shafts, the entire engine is made of an aluminum alloy and weighs 2,000 pounds. It develops 160 ac-

FAST ADDS TO MENTAL ABILITY IN PREPARING FOR TEST

If you want to do your best at examinations, it may pay you to go without food for several days provided you eat just before the test. In experiments at the universities of Chicago and Michigan, volunteers who starved themselves for periods ranging from ten to thirty-three days were found to be physically fit. Steadiness of the hand was improved, while the mental processes were increased if the faster took food shortly before examination.

reported by Dr. J. A. Kellogg
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Kansas State Teacher's College
Stearns Service
12/21/31

"Nets" of Light on Clouds Trap Air Raiders



Left, Night Photo of Net of Light Projected against Sky; Above, the Equipment

recent test, a bomber of the latest type flew 12,000 feet above London, blanketed in fog, with its engines muffled so no noise was heard below. Ordinary searchlights scanned the sky in vain, and just as the "enemy" was about to release his flares, indicative of bombs, he was netted in a great square of light, divided into sixteen smaller squares, the beams of which he had not been able to see until he was directly in their path. Etched within one of the smaller squares, the position of which was quickly correlated by the gun pointers below, he was a perfect target.

HOW FAST YOU LIVE SHOWN BY ELECTRIC METERS

Light of three-billion candlepower projected against the clouds in the shape of a rectangular grid, by means of which enemy planes' positions may be accurately plotted, is a new British invention that threatens to change aerial tactics. In a

Another difference between the nervous, energetic person and the slow easy-going character has been reported by scientists of the Mayo foundation. They have found that those whose internal fires burn at a rapid rate generate small differences in electrical potential between two points on their arms or legs, while those with low rates show higher readings. The potential differences are extremely minute, of course, usually limited to a few thousandths of a volt. It also was found that the voltage is increased by an emotional storm or a hearty meal. (C)

storm or a hearty meal.
 My Charles Sheard
 Charlotte Purdy
 Rochester, Minn

Maynard
M. Metcalf
A 25 78 Alameda C
710 E Broadway
Isle of the City

POPULAR MECHANICS

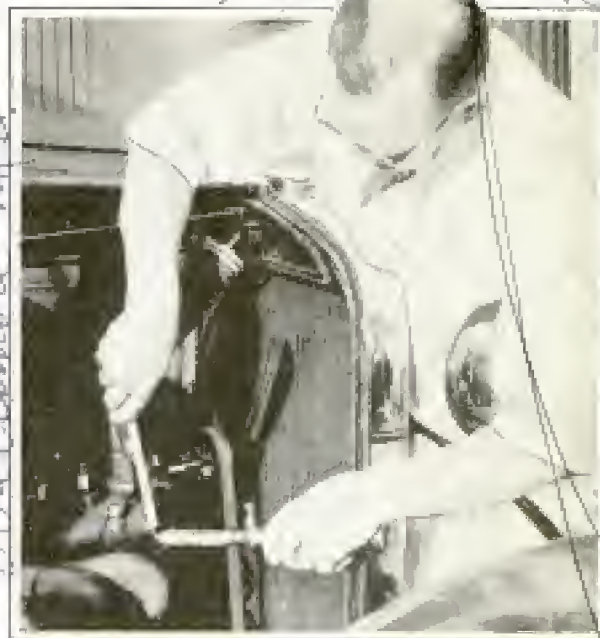
EASY POISON-IVY TREATMENT
RELIEVES PAIN QUICKLY

An easy and simple method for the relief of poison-ivy irritations has been recently described by a Johns Hopkins University scientist. He explains that the poison is in the form of an oil and that the dissolving and removal of the oil before it can be absorbed into the skin is the most effective cure. His method is to prepare a hundred or so pinches of absorbent cotton; fill a saucer with alcohol, of seventy-five per cent or greater strength; dip the cotton into the alcohol and sop up the poisonous oil, throwing each pinch away as soon as used and being careful not to allow the alcohol to dry on the skin. The alcohol should be frequently changed. About fifty applications are usually sufficient for a small patch of poison. The first thirty applications should not be rubbed, merely sopped. After that, it is well to rub with the wet cotton each time. At last, rub vigorously to bring the dissolved poison out of the pores, and to break any small blisters that already may have formed. The more extensive the poison patch, the more swabs will be needed, and the more treatments with relatively varying degrees of pressure are necessary. Fifty swabs are sufficient for a patch the size of a silver dollar.

STATE MAP ON AUTO RADIATOR
IDENTIFIES YOUR CAR



Tourists traveling outside their own state are now employing a radiator map of their home commonwealth to aid other motorists in identifying them. The map is painted on the front of the radiator, red or black being used for the borders and white, or some other contrasting color, for the map itself. Approaching drivers thus easily identify a car by the radiator where they might have difficulty in observing the license plates.



Repairing a Cracked Water Jacket on the Road with New Soldering Material

SOLDER FOR WELDING IN HOME
FUSES WITH ALL METALS

Home welding is made easier by a new kind of solder now on the market. The product may be fused at a comparatively low temperature, but requires a much higher temperature for re-fusing. Aluminum, copper, pot metal, cast iron, steel, brass and all other metals may be soldered. A chemical reaction causes the metal surface to break down, the metal and solder fusing into a solid piece. Steam pipes can be soldered with this substance to withstand 500 pounds of steam pressure, kitchen utensils can be repaired in the home, and a cracked automobile water jacket can be fixed speedily on the road. An ordinary soldering iron is used.

COMMON ELECTRIC LIGHT AIDS
IN CURE OF RICKETS

Babies can be cured of rickets by exposure to electric lights, such as are used for illuminating purposes, recent experiments have shown. Lights used for this purpose are the 115-volt, 500-watt tungsten-filament bulbs incased in frosted glass. The bulbs are placed in oxidized-aluminum reflectors and suspended five feet or more above the patient. Children so treated usually tan, but there are no reports of sunburn. Exposure is for twelve hours a day for about three months.

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Valparaiso
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Miss. Conn. - Mrs. H. J. Krustenberg
A. J. Horech

U.S. Co. Chicago Tribune

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POPULAR MECHANICS

Mr. Newton Kaines
Mr. J. A. Chambers.

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Neat and Compact
Juicer That Makes
Apple Cider before
Your Eyes from
Finest Fruit



CIDER IS MADE BY THE GLASS IN FOUNTAIN JUICER

Fresh cider, which, if allowed to stand even for a few hours, will deteriorate, now can be obtained right from the apple and you can even inspect the apple, as the result of the introduction of a fountain apple juicer that operates electrically and automatically. When the order is given, apples are dropped into the hopper of the neat and compact device, occupying only two square feet of space, and in a minute or less they have been ground and hydraulically pressed into cider. Difficulties of storing cider without preservatives which change its natural flavor are obviated. The machine can be dismantled and cleaned at the end of the day in about ten minutes.

SOUND WAVES KILL GERMS

Ninety-nine per cent of the bacteria in milk can be destroyed by forcing super-sound waves through the fluid. The waves do not spoil the milk for human use. The

N.Y. Herald Tribune
12/30/31

milk is fed upward through an inverted funnel. A hollow tube aimed at the funnel just below its large end vibrates at high speed to produce sound waves which are concentrated in the funnel. Sound kills the bacteria because it is a form of energy. The tube, vibrated by electricity, may be operated continuously, the milk being fed into the "sound sterilizer" as fast as it comes from the dairy.

See June 1931

FIRST ESKIMO MIRRORS FOUND ARE MADE OF SLATE

Digging in the frozen ground of Cook Inlet, Alaska, a young woman archaeologist has found the first mirrors ever discovered in a prehistoric Eskimo settlement. Used by the women, and possibly by the men of the tribe, these ancient aids to beauty are made of slate. In order to reflect the features of their devotees, the mirrors had first to be dampened. From the scientific standpoint, the most important discovery of the expedition that found the mirrors is the fact that Eskimos ever inhabited the region at all. The territory around Cook Inlet now is regarded as the southern extremity of the early Eskimo advance into Alaska. In shell heaps, sometimes fourteen feet high, the expedition found prehistoric ornaments such as lip plugs, beads, an ivory pendant, carved ivory head, a nose pin, lamp, needle case and needles.

See June 1931

HERE IS THE OLDEST PICTURE OF MAN ON HORSE



Believed to be the earliest evidence of the domestication of the horse, sketch drawings of mounted men have been found on bone implements buried below the ruins of Susa in what is now Persia. Two figures have been confidently dated as of about 3100 B. C. Susa was the capital of ancient Elam and is believed by many to be the oldest city on earth.

See June 1931

Described by Pere D. Schell, of Paris

See June 1931

Caisson Shell Digs Own Pit in Ten Minutes

Four feet in diameter and thirty feet long, a caisson shell recently sunk itself into the earth in ten minutes in building the subpiers for a Chicago bridge. The shells are steel casings and each is sunk by affixing to its bottom rim six jets through which 1,000 gallons of water per minute are forced under pressure of 135 pounds to the inch. The jets have orifices at both the top and bottom, the bottom loosening the earth below and the top forcing it out of the hole, the shell dropping by its own weight. The shell then is filled with concrete and becomes one of the supports for the bridge. It takes about twenty of the big caissons for the Chicago project. The process replaces the old method of digging the caissons by man power, under high air pressures, requiring days and often weeks of time.



Photo, Frank M. Hallenbeck
Giant Caisson Tube Digging Its Own Pit by Means of Water Jets on a Big Bridge Project in Chicago

Al Johnson, Construction Co. 520 E. North Water Chicago

STEEL SHIELD GUARDS DRIVER OF TRUCK FROM ROCK

Trucks being used in the construction of Boulder Dam are equipped with a steel



Steel Rock-Catching Shield Protects Driver,

roof shield, three-eighths of an inch thick. The shield is part of the truck's body and is placed there to protect the driver against possible injury from falling rocks at the gigantic project.

"EYELID CRUTCH" FOR GLASSES HELPS CORRECT SIGHT

Glasses fitted with a "crutch" will help to correct ptosis, a paralysis which causes the upper eyelid to droop or to close completely, resulting in partial or total deprivation of sight. The crutch consists of a half hoop of thin gold wire, fitted to the contour of the patient's eye socket and welded to the nosepiece of the spectacles. Precise fitting to the eye is accomplished after the wire is welded to the glasses. The crutch is adjusted by putting it on over the patient's closed lid and then pulling the lid over the gold arch.

Sulpho-cyanide of ammonium, dissolved in an equal weight of water, will lower the temperature from sixty to ten degrees Fahrenheit.

Maxbrockhoff Chemical Works

Perfected in clinic Pennsylvania State College under Dr. John C. Neill

Herald Tribune 12/9/31

Wid. Work

Franklin Institute 23-359 Phila

-A2424 Cont. Joseph H. Mountain,
650 Main Street
Los Angeles, Calif.

"BUG-MEN" Lead Hunt

Searching for Oil With A Microscope



Samples-Containing "Bugs" Being Boiled with Acids to Loosen the Tiny Fossilized Shellfish for Microscopic Examination

TINY bugs, dead millions of years, recently led to the discovery of a great California oil field, whose millions of barrels of sticky "black gold" brought sudden wealth to many producers. These tiny fossil bugs are today locating new sands far below the producing levels of nearly dead fields. They infallibly tell drillers when to set casing, when to abandon hopeless drilling projects and when to spend thousands of dollars more to reach their goal.

In years past, several dry wildcat wells were drilled near Venice, Calif., but not until oil men applied the newly developed

science of micro-paleontology to the old samples of shale and sand from these "clusters," was there definite promise of an oil structure.

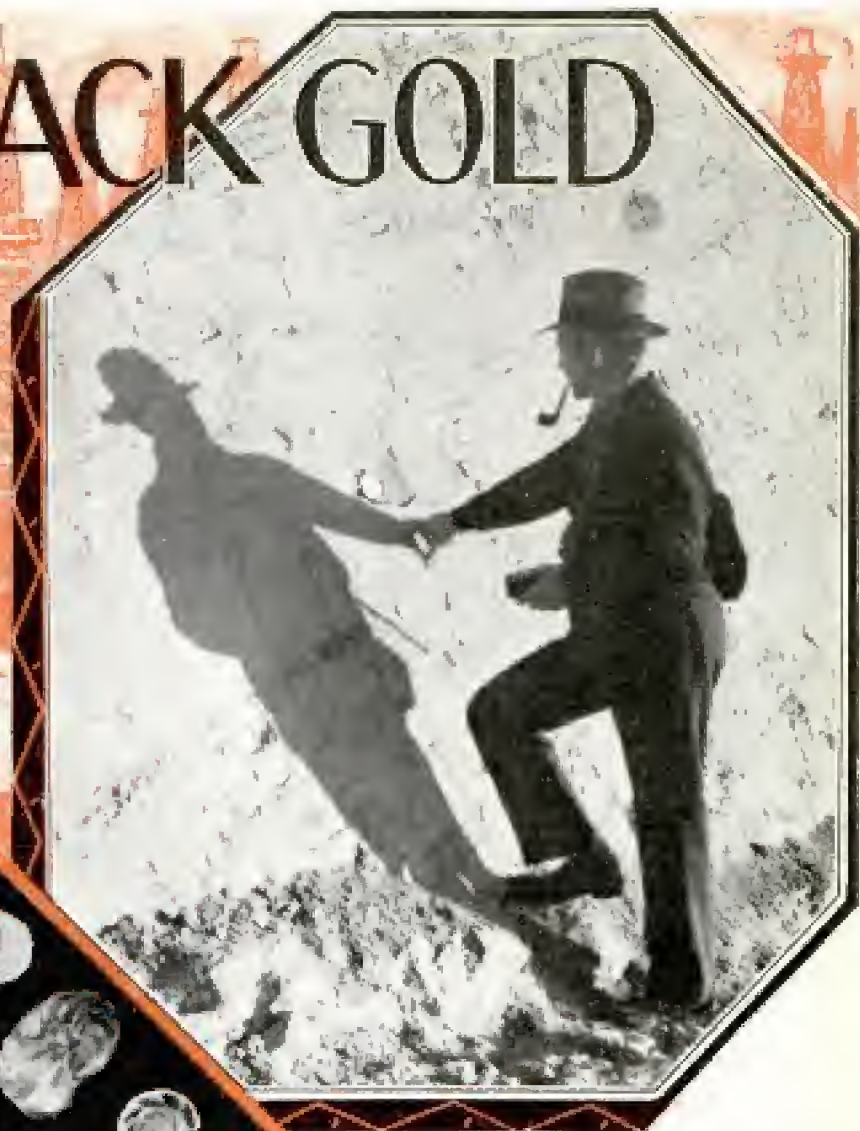
Locating the oil structure is the greatest problem in prospecting for oil. Level fields or lofty mountains may cover buried hills and valleys. The layers of which the earth's crust is composed have been lifted, twisted, and folded by the earthquakes and convulsions that have occurred since these strata were deposited on ocean beds in long

forgotten ages. When these layers are arranged so that they form a subterranean hill, or anticline, the prospect of oil is favorable.

Although many methods of mapping this underground topography have been devised, the one used by "Duke" Curtice, a Los Angeles oil operator, in the discovery of the Venice field is not only the newest, but perhaps the most effective. Micro-paleontology, or "bug hunting," depends on the fact that in each layer of the ground certain kinds of bugs predominate. These bugs, the fossilized remains of microscopic shellfish, may be identified and

Arthur A. Curtice,
Bartlett Bldg. 215 W
7th St. Los Angeles, Calif.
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for BLACK GOLD



Above, Geologist Studying Walls of Excavation to Find Types of "Bugs" Predominating; Below, Magnified Bugs

their types traced to determine the underground structure.

"We were making a subsurface contour map of the whole Los Angeles basin," said Mr. Curtice, "when it became apparent that there was a strong likelihood of an oil structure on the west side of the basin. Immediately we redoubled our efforts in

this locality. From hundreds of outcrop and well samples, we picked thousands of bugs, examined them under the microscope and classified them. Correlation of the findings from several oil wells, together with what little surface information we could get, gave us a fair, but not a complete, picture of the subsurface conditions.

"On the basis of the information we had, we estimated the location of the structure, leased 850 acres and drilled a test well. Although we went to about 7,000 feet, we did not strike oil. We were 'off the structure.'

"But we were not disappointed," the oil man continued. "During the drilling of the first well, we took a great many core samples. From these we were able to obtain enough information to complete our picture.

Q2424



Above, "Bugs" and Sand Classified for Reference;
Right, Microscopic Slides Containing Bugs

"We moved our location exactly one mile west, drilled a well, and brought it in with an initial production of 2,600 barrels."

Micro-paleontology was here the cause of the most phenomenal example of town-lot oil production ever seen in the industry. But many other uses are being found for this new science: locating productive zones, showing depth of new oil sands, determining the geologic age of formations, identifying structure, showing faulting and extending productive area of old fields. In many ways these tiny bugs are leading to riches.

One of the valued services rendered by the "micro man," or paleontologist, to the oil company, is predicting the depth of the oil sand. In the Signal Hill and Dominguez, California, districts a few years ago, this sort of information would have meant success instead of failure, riches instead of poverty for many drillers. Many of the wells drilled in that district were abandoned as dry when later information showed the prospectors' bits were within two or three hundred feet of producing

sand. Thanks to the bug man and his microscope, such a catastrophe cannot happen again.

These subsurface surveyors are able to chart the underground seas of liquid gold with such marvelous accuracy that the companies depend on them for drilling locations, underground geologic structure and a great mass of information necessary to successful operations.

But such confidence has not always been placed in the micro men. One well in the Coalinga, California, district was supposed, from surface indications, to be on the crest of an anticline. If this had been true, they would drill through the thin layer of Pleistocene formation and strike the Pliocene at a shallow depth.

"At 1,500 feet our bugs showed



conclusively that we were still drilling in the Pleistocene, which proved absolutely that we were not on an oil structure. There was no hope that we would ever strike oil," the paleontologist said, "but the operators had no confidence in our results. At a cost of several thousand dollars, they drilled 3,000 feet deeper before they had enough."

Another operator drilling a well in the Los Angeles basin was advised before he spudded in that he was off the structure. The micro men had sufficient evidence

from near-by wells to show that the new location was not over an oil-bearing structure. This operator drilled to a depth of 8,000 feet at a cost of more than \$150,000 before he was convinced that the opinion of the bug men was correct.

The unbelievable accuracy with which this new science can predict the depth of a particular formation is used frequently as an indication of when to set casing. In order to avoid reducing the size of the hole, it is desirable to set the casing as late as possible before drilling into the oil sand. By means of micro-paleontology, the depth of the oil sand is often predicted within ten feet.

In the North Belridge field in San Joaquin valley, California, paleontologists were puzzled by the absence of the so-called valvulineria zone which was always encountered a few feet above the producing sand in many other California oil



Core Samples from Wells Containing "Bugs"; Pencil Points to a Fault Shown in a Core



fields. By examination of the bugs taken from the relatively shallow wells of the North Belridge district, the micro-fossil men decided that the valvulineria zone should be considerably deeper than any of the wells.

Since the old shallow wells were producing little oil, a test was made. The Belridge Oil company's No. 15 was drilled to a depth of about 4,850 feet, 3,000 feet deeper than any well in the district. At

this depth presence of characteristic micro-fossils indicated the valvulineria zone. The driller knew that in a few more feet the producing sand would likely be found. Casing was set at 5,000 feet, and the well was drilled into the sand. With a production of several thousand barrels of oil and more than twenty million cubic feet of gas, this well opened an era of unprecedented production. Within a few weeks, somnolent old North Belridge was buzzing with activity. Not only were many of the old shallow wells immediately deepened, but dozens of new wells were started to tap this newly discovered reservoir of liquid wealth.

The Seal Beach, California, field might never have been developed had the services of subsurface men not been available. After carefully surveying the surface geological features of the district, a large oil company obtained land and drilled two or



Above, Paleontologist Hunting for "Bugs": Right, Magnified Varieties of the Tiny Diatoms

three wildcat wells. Although the surface indicated the presence of a good structure, the wells, one after the other, proved to be dry holes. Other companies drilled a few wells, on the advice of geologists who depended upon the same surface indications, but these also were "dusters."

Finally, after all the others had become discouraged and had given up their holdings, one company, which had been doing a great deal of micro-fossil research, entered the field. They carefully surveyed the subsurface formations by means of micro-paleontology and found that the old wells were on the wrong side of the fault along which oil was expected. This company drilled on the other side of the fault, brought in a good well and reaped a reward which many times over repaid them for their research.

MOVIES REVEAL "HURTS" FELT BY MATERIALS WHEN BENT

Motion pictures have made visible the "hurt" felt by materials when they are bent, punched with a sharp die or subjected to other stresses. The movies are the work of Dr. Max M. Frocht, of the Carnegie Institute of Technology, who has conducted experiments in connection with investigations in stresses and strains in gear action, tool cutting and impact shocks. He found that, while the duration

of the direct impact was only about one thousandth of a second, the material receiving the shock "felt" it for a period varying from half a second to more than a full second. He also found the shock due to a falling weight is at least six and one-half times that caused by the same weight resting on the material. Movies were made of fifteen models set up in different positions to show the variety of stress distribution. The patterns were filmed from such sources as holes, grooves, notches, sharp curves, scratches and



steep edges. The pictures illustrate the destructive effect of stresses at close intervals, and show that a scratch on a polished surface is of greater potential danger than one on a rough surface. The records were obtained by photographing the patterns caused by the stresses to which transparent blocks of bakelite were submitted. The polarized light caused beautiful patterns to appear at the point of stress. To the civil engineer, the tests suggest the danger of placing a flat-end steel column on a concrete floor, and to the mechanical engineer the similar danger resulting from mounting of machinery on foundations.

Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.

P2424
P2536
N.Y. Herald Tribune
12/20/31
Pittsburgh Pa.

A.A. Anderson and

H.B. Wright Chicago

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POPULAR MECHANICS

Highway engineer

MORNING HEAT SWELLS TIRES OF AUTOS IN TESTS

Changes in temperature from early morning to noon have a noticeable effect on automobile tires. In recent tests, the increase in temperature was sufficient to swell balloon tires so the auto, which ran smoothly at eight o'clock, bounced uncomfortably at twelve. Test runs of over 3,000 miles indicated that tires wear less on Portland cement than on non-skid asphaltic concrete. Sensitive depth gauges are used in testing the wear on tires, since weighing is ineffective, due to variations in weight according to the weather.

BAT HAS LEAFLIKE NOSE AND "FILE" FOR TONGUE

Leaf-nosed fruit bats are sometimes found in the West Indies and farther south. The appendage is supposed to be a special sense organ of great keenness. The tongue is no less remarkable as it has a roughened tip like a file, used to rasp fruit which is now the bat's diet. That such was not originally the case is indicated by the powerful teeth which seem to show that even at present some of the species may be carnivorous. The larger types are red-furred, and their wings spread more than two feet from tip to tip.



Giant Leaf-Nosed Fruit Bat Showing Its Filelike Tongue, Used to Rasp Its Food

Carl Paul Ed Haver
Bruce Museum, Bruce Park
Long Beach, Conn.



The Front of This Tokyo Department Store Provides the Face for a Giant Clock, Six Stories High

CLOCK FACE SIX STORIES TALL COVERS FRONT OF BUILDING

One of the world's largest clocks has been erected on the front of a Tokyo department store, its face being six stories high and covering most of one side of the building. The minute hand is twenty-eight feet long and turns about a central axle which contains the mechanism.

X-RAY SAVES LIVES IN MINES BY TESTING FUSES

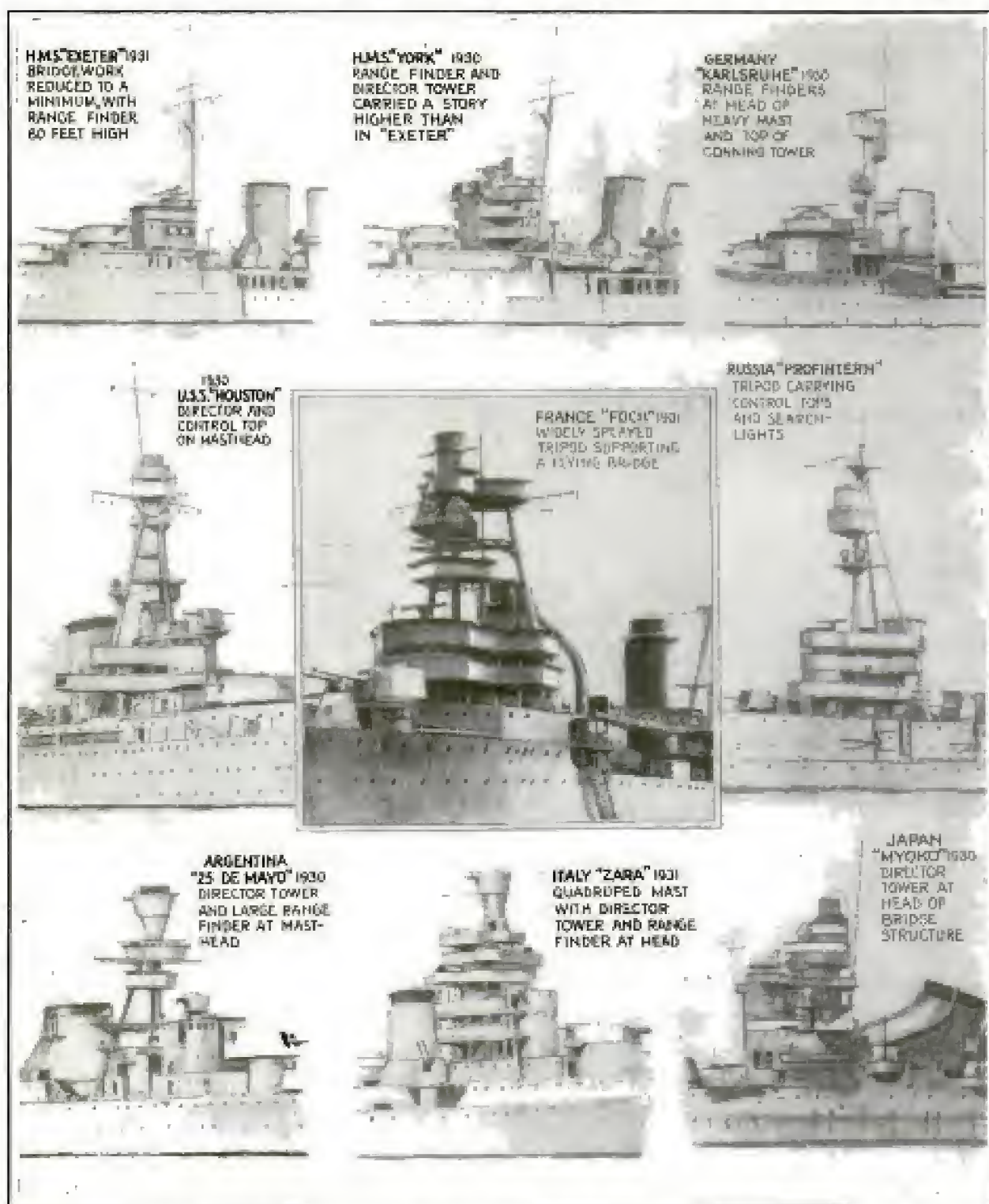
One of the most unusual purposes for which the X-ray ever has been employed has come to light in the mines of South Africa, where fuses are exposed to them before being used in blasting. Miners often have complained that the running fuse—one that burns too fast for the miner to get away from the explosion—has been the most frequent cause of accidents. Every foot of fuse, accordingly, now is X-rayed to guard against the possibility of a defective section.

Johannesburg

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Carl Paul Ed Haver
Bruce Museum, Bruce Park
Long Beach, Conn.

The Latest in Fighting Ships and Their Eyes



Sketches Showing the Different Types of Mast and the Various Styles of Range Finders Employed on Fighting Ships Today; British Ships Are Reducing Their Bridgework

By OSCAR PARKES

One of the most remarkable features in the latest British cruisers is the disappearance of the tripod mast and lofty bridgework which has hitherto been re-

garded as essential for the housing of the range finders, control tops and searchlights. While naval constructors of other nations seem to be vying with one another

er as to who can produce the most formidable-looking structures in the way of combined mast and bridgework, the trend in British design is again toward a minimum of target and top-weight in this direction. Thus, the "York," completed in 1930, has a three-story bridge and pole mast, whereas in the "Exeter," just finished for sea, the bridge is reminiscent of thirty years ago before gunnery control was invented, her main range finder being only some sixty feet above water level. The tripod has grown into a quadruped capped by a huge conical tower and surrounded by tiers of bridges in the Italian "Zara," and even a stage further in the Japanese "Myoko," where the central cone mast is hidden in a pagodalike structure around which range finders and searchlights cluster like blackberries, necessitating a signaling pole being clapped on abaft it to serve its original purpose. The sketches show the various styles of masting adopted in contemporary cruisers, and the range finders can be clearly seen. All except the Russian ship have them mounted in the turrets. "Karlsruhe" has a strong and rigid mast adequate and efficient; "Houston's" mast is an enlarged edition of the earlier British type, while "Foch" bears a gaunt structure at the top of which is a flying bridge.



Top, Front Suspension, and, Below, Rear of Auto That Has No Axles

MOTOR CAR WITHOUT AN AXLE GIVES BETTER RIDE

With its frame suspended between two sets of double transverse springs, both front and rear, an automobile without any axles has made its appearance in California. Unsprung weight, the bugaboo of automobile engineers, is almost entirely eliminated by the novel design and, by mounting the differential directly between the side rails of the frame, the center of gravity has been lowered materially, since it is not necessary to allow clearance between frame and housing to prevent hitting "bottom" when the car goes over rough stretches. Drive is taken from the differential through two universal-jointed shafts. A new form of steering linkage also is incorporated in the design, the tie-rod being double instead of single, and linked to a crank arm, one side of which connects through a drag link with the steering assembly. In tests, the car traveled smoothly over six-by-six-inch timbers laid crosswise of its path at eight to ten-foot intervals, jumped curbs and was able to outrun other cars because it could turn corners at high speeds.

HOLDER FOR WATCH, CIGARETS AND MEMORANDUM PAD

As a convenience for the automobile or desk telephone, a holder is now offered with receptacles for a watch, cigars, memorandum pad and pencil. It also contains a removable ash tray, the curved top of which serves as a cigar holder. The combination clamps to the steering column in the car just below the wheel or to the base of any type of desk telephone.



Holder for Watch, Cigarettes and Memorandum Pad Which Attaches to Auto Wheel or Telephone

Lindelius & Eccleston, 3547 N. La Brea Ave. Los Angeles, Calif.
 Kruger

Kruger Stamping Co
 1907 Jefferson Ave.
 Toledo, Ohio

Owned by Mrs. A. A. Bigsfield Bart. Worcester, Mass.
 12525
 Vlasto shown at

Cont. Nannine Joseph
 54 W. 42nd
 New York

KINDNESS

Barzoi



A Winning Team of Russian Wolf Hounds Which Walked Away with Four First Prizes When Exhibited at an English Show

bones to him. As to the sugar—did nobody ever bother to tell you that a dog's digestive organs have no apparatus for handling sweets?"

"I believe in kindness to animals," he returned, stiffly. "My dog has done well today. I am going to reward him."

"You are going to set forward the date of his death," I corrected him, "if you follow out the program you just spoke of. More dogs are killed by ignorant kindness than are killed by motor cars. And heaven knows the cars kill enough of

THE splendid young chow had won every blue ribbon in his various classes; and at last won the purple rosette of the "Winners' Class," which gave him three points toward his championship. His novice owner led him in triumph back to his bench. As they passed the coffee benches where I was grooming one of my dogs, I heard the novice declaiming rapturously to his victorious chow:

"Oh, Ming, you were great! As soon as we get home tonight I am going to give you a heaping plate of chicken bones and a whole pound of lump sugar."

Now this was no affair of mine. But I crossed over to the blithering novice and said to him:

"Why not give your great young dog a heaping plateful of strychnia, instead? You'll get the same result more quickly and much less painfully than by feeding chicken

them." Evidently he thought me an intrusive crank. For he turned haughtily away and busied himself with preparing his fine chow for the "Best of Breed Class." I never knew whether the young dog died from that night's gorge of chicken bones or from some later feast of the same kind. But the incident set me thinking. Mistaken kindness has killed and will



Here is a remarkable contrast in Kennel Blue Bloods; at the left is a Spitz puppy imported from Russia and of Aristocratic Mien and Family; Above is a Prize-Winning English Bulldog Looking Disgusted for the Coaxing Photographer

Owned by Mrs. J. L. Pennock
 Syracuse, N. Y.

Diagnosar Son of
 Rhy. owner W. Clarke
 Detroit

also Sunnybank Farm R 2525
Pomfret Lakes, N.Y.

Can KILL Them

By

Albert Payson Terhune

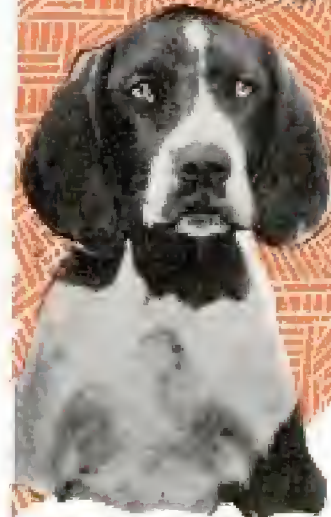
67, Riverside Drive,
New York

kill many thousand dogs. This kindness may take any one of myriad forms. If it were a matter of cruelty or of neglect, I would see the uselessness of protesting. But when love for an animal leads so often to that animal's death, perhaps a word or two of sanity may save the lives of a few other dogs.

Ayer, Mrs.
Lewie
Craigm. Pa.

Laurestin Legacy

Rec'd
March 1942



Three Blue Bloods of Three Different Breeds; the One at the Top is Registering Anticipation

the parsley you chew so harm- lessly would kill your parrot. The bel- ladonna leaves which your rabbit can nibble in safety would kill you. The unchewed gulps of hard food and the swal- lowed knuckle bones which don't seem to dis- tress your dog would send you posthaste to the hospital.

In like manner, diet and treatment which are fair- ly safe for you are sometimes hideously harmful to your dog.

The novice I have spoken of was going to fill his chow's stomach with chicken bones, not knowing that the half-chewed bones of any form of cooked poultry have a tendency to split into many sharp little slivers which soon or late will pierce a dog's throat or stomach or intestines, and kill him. With large dogs, chop bones of- fer a like, if slightly less peril.

In the first place, no dumb creature's physique is in the least like a human's. The things which you enjoy and which do you no especial harm, may be murderous for your pets, and vice versa. For instance,

Cake, pastry, candy—these are not bad, in moderation, for a healthy human sys- tem. They are ruinously bad for a dog. You like these sweets. You like your dog

Q2525

Dogs of Sweden, owned by Mrs. J. Wood, shown at Crystal Palace

and you want to please him. So you dole out sweets to him. It would be less unkind to dole out kicks. They would do

Below, the Magnificent Head of a Full-Grown and Rather Haughty Mastiff



him less ultimate harm. You give him daily food which seems palatable and healthful to you. So you think he will like it as much as you do. Perhaps he will like it, after you have spoiled his taste for more normal canine food. But it works havoc with him; even as severe dog diet would wreak havoc on your own inner man.

And you do it in the name of kindness, this cruelty. Your dog by nature is 100 per cent a normal, wild animal, plus a perhaps unfortunate ability to adapt himself to his exotic surroundings as a household pet. The nearer you keep him akin to his original wild state the healthier he will be and the longer he will live.

In the wilds, he had plenty of exercise. Not meekly slow ploddings along hard pavements at the end of a leash, but sweeping runs over dirt and turf. Does he get that, and get it daily and in large-sized quantities, in your home? If not, you are shortening his life and undermining his health. No sedate walk on a leash is going to take the place of those wildly ecstatic scamperers.

I am writing this article at my outdoor desk, here at Sunnybank. Seven of my ten dogs are loose on the lawn. All ten of them had a two-hour ramble through the forests and over the hills this morning, in-

terspersed by romps and races. The seven which are now loose spend much of their time sprawling on the ground near my desk. Yet every few minutes one or another of them gets up and incites his fellows to a tearing gallop or a swim, returning presently for another doze beside the desk. Two minutes of this top-speed hill-side galloping or tag-playing does them more good than if I led them along ten miles of sidewalks. They

are hard and lean and of ravenous appetites, and fairly sizzling with high spirits. In brief, they are as near as I can make them, physically, to their wild-dog ancestors of many thousand years ago.

After they pass the age of twelve months, they get but one meal a day; a big meal which duplicates as far as possible the best kind of diet I can imagine the wild dog as having: beef bones to gnaw; meat seraps mixed with greens; an avoidance of starchy foods. Add to this an occasional hard dog biscuit, a dish of milk, some form of roughage. These last items constitute an effort to adjust the eaters to civilized conditions and to adjust civilization's exigencies to them.

I don't claim that I know everything about dogs or about their correct diet. But I do know that my regime has given me a series of gloriously healthy and hardy dogs for a period of something more than forty years, and that the bulk of my dogs live to great ages, as did old "Sunny-

Memorial Hospital Boston
at Angell
 Bandaging the Foot of a
 Fox Hound That Spent
 Eight Days in a Trap and
 Finally Was Rescued by
 Another Dog; Below, the
 Smile of a Blue Ribbon
 Winner

bank Lad" who lived and thrived until well after his sixteenth birthday.

Then, as to housing your dog: Perhaps you yourself like a very soft bed with plenty of warm covers, and a warm room to sleep in. This is pleasant to you. So you infer it must be a good thing for your dog. It is not.

In the most freezingly inclement winter weather, the wild dog crept into a cave or under a windfall tree where an irregular ruffle of dead leaves formed his bed. He was geared to that kind of sleeping quarters, and he thrived therewith. You shut him in a hot and ill-ventilated room, either in a softly bedded



Wencha Karen

basket or else on a downy bed of some other kind. Some of you even put a blanket over him, to keep him warm while he sleeps.

What would be the effect on you if you should dash out into a blizzard while you were still enervated and sweating from a Turkish bath? You would die more quickly and more readily than does your dog when he goes out into the winter air from such a bedroom and bed as you provide for him; but that is only because he is hardier and more adaptable than you are.

Sleeping on a deep and soft bed in a warm room will eventually sap his health, even if it does not kill him at once.

Here at Sunnybank, every kennel dog has a raised house whose floor is at least fourteen inches from the ground and whose narrow door faces south. On hot summer days, the dogs can burrow in the cool earth beneath these houses. At night, if they will, they can sleep on the floor boards of their houses. The floors are dry and high; and the kennels themselves are tight-built.

In winter a deep coating of prepared cedar shavings covers the kennel floors; that or hay or straw, but preferably the shavings. The bedding is changed before it can get matted or soiled or weather damp. My two house dogs sleep on a thin rug on the floor of a room whose windows are open. As I have told you, they are well and they seem happy.

If you keep a dog in the house, let him have a good-sized roomful of fresh air all night, and let his bed be a not-too-thick rug. Your mistaken ideas of kindness will soften him and make him susceptible to any of several ailments.

In my long-distant childhood, pugs were the most fashionable of all dogs. Not only were thousands of these killed by kindness, but that same mistaken kindness led to the breed's loss of popularity and almost to its extinction. Every magazine picture of a pug represented him as fat and asthmatic and waddling.

32525

Emerald Pearl. Entered at

382

POPULAR MECHANICS

*metropolitan and Essex along about
at Crystal Palace London*



A Huge St. Bernard and His Little Playmate; He Represents a Lot of Dog Even for \$5,000. Which Was the Price One Man Offered for Him

Decently treated, a pug is a fine and vigorous and clever and healthy dog, an excellent chum. But seldom, in his prime, did he have decent treatment. He was coddled and cosseted, and put to sleep in a padded and airless basket, and stuffed with more food and richer food than a dog three times his size could have assimilated. Also, his exercise was usually confined to a short and slow daily walk. What happened? He grew as fat as a barrel. He hated to move. He wheezed at every breath, and he rolled in his gait, under an unwieldy mountain of soft flesh.

Cartoonists and comic paper artists began to make fun of the poor little chap. Among them they laughed him out of his once boundless popularity. It was his idiotic owners who should have been laughed at, not the kindness-ruined pug himself.

If your child were deprived of exercise and were stuffed unmercifully with fattening and indigestible food and were soft-

ened by being kept in a heated incubator all night, you could not expect the luckless youngster to have much stamina or figure or brains.

Many more dogs die from overeating than under-eating. Many more dogs die from food that is too rich than from food that is too meager. Many more dogs die from over-coddling than from over-exposure. Remember that. And if you don't believe me, ask your veterinary. Unless he is one of those rare and inexcusable vets who grow rich by prescribing for pampered dogs, he will endorse all I say.

There is no magic, no mystery, in the correct upbringing and treatment of a dog. The whole thing depends on patience and on common sense. With his owner's wholesale use of those two assets, there is no dog that cannot be

kept healthy and that cannot be made a good canine citizen. Until you make him abnormal by abnormal treatment, your dog will prefer to live in a normal and healthful fashion. Such a dog is the most ideal chum a human can have. But if you kiss and cuddle and fondle him and feed him on masses of indigestible foods and cut off his rightful amount of exercise and soften him by too-luxurious sleeping quarters, you are going to have a worthless dog, and at an early age a dead dog.

When and if your dog falls ill, care for



him at home. Don't try to save a \$3 veterinary bill by giving so-called "home treatment" to a \$300 dog. But don't send him to a hospital unless you have to. Send for the best vet you can find, and follow his prescribed line of treatment. But let that treatment be given at home.

If you yourself are sent to a hospital, you know it is done for your good. Your dog does not know that. All the poor animal knows is that his owner has apparently forsaken him at the very time he most needs that owner's care and companionship. He knows he has been thrust out of the home he loves and has been consigned to strangers. Keep him at home. That is almost half the battle for health recovery. It is worth a thousand times more than all the mistaken kindnesses you lavished on him when he was well.

Here is a simple remedy which I apply at once, the moment one of my dogs seems mopey or off his feed: A huge dose of castor oil. He will hate to take it, and it must be given by force. But, three times out of five—or oftener—it will cure him, if it is given soon enough. Don't be afraid of giving him too much. There is no danger from an overdose.

Don't force a half-sick dog to eat. His instinct is a wiser guide, just then, than is his master. If your dog is sick, keep him by himself in a darkened room, and let

him sleep all he will. See that he has plenty of fresh and cool water within reach and that he is kept out of drafts.

Sick or well, see to it that your dog always has plenty of fresh and cool water close at hand or where he can find it. A dog needs to drink much oftener than does almost any other animal, and he suffers worse from the lack of water, especially in hot weather.

Don't kill him by what you miscall kindness. Give him a square deal. That is all he wants or needs.

And don't forget what I said about patience and common sense.

Those two simple qualities, by the way, are the keystones to more than most of

*Es H Puglish
Owner Mrs
O. W. Wally
at Olympia
Shoa*



Top, a Winner of Twenty-Three Championships; Left, a Group of Pointer Pups

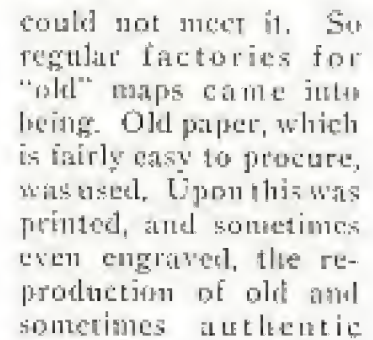
us realize. Never are they in better use, nor of greater importance, than in the treatment of a dog.

Their application, or the neglect of them, will decide whether your dog is to be a pet or a pest.



*gent Oland,
San Marcos, Calif*

James



maps. With old and yellow paper, dead and faint colors, and China ink slightly rusted, artists have turned out some very creditable imitations. These maps are artistically done, beautiful in texture, and quite as much an adornment for a lamp shade, fire screen or wall piece as the genuine articles.

DISEASES ARE GIVEN NUMBERS

Easier designation of diseases by numbers instead of names has been adopted by New York hospitals. According to this plan, number 6, signifying the digestive system, and 1, signifying infection, would make 6-1, infection of the digestive system. The manual for numbering will include 10,000 or more conditions.

include 10,000 of more conditions.

Developed by H. R. Hensel and Co

B. 35 Cont John L. Cogswell 385

POPULAR MECHANICS
STEEL STUDY AFFORDS GREATER SAFETY IN BUILDING

Bigger and higher skyscrapers, better bridges, hotels, apartments, elevators and machinery now can be built with even a greater factor of safety than heretofore as the result of new steel research carried out by the Westinghouse Electric and Manufacturing company. What happens to steel of any type when placed under too great a load can be told by a process just completed. Ten years ago, a German physicist discovered flow lines in steel that had been too highly stressed. He found that etching would bring out the lines and make them visible for study. Present-day steel, however, does not contain enough nitrogen to make the etching process a success. Westinghouse research workers have developed a technique of nitriding steel so that the etching will show, thus making it possible to pick out any weak spots that might develop in building before they actually occur.

TRACTION TREADS FOR TRUCKS FIT OVER TIRES

Trucks equipped with pneumatic tires can be given added traction by attaching iron treads over the rubber. These treads consist of steel plates with ground-gripping edges. The plates are fastened to a chain around the tire, giving a tractor-type of tread.



Steel Plates Attached to Truck Wheels to Give a Traction/Tread to Pneumatic Tires

*Hipkins Mfg Co
Port Deposit Ind*



Dentist's Office Equipped with Movie Projector Which Throws Pictures on Ceiling to Entertain Patients

MOVIES ON CEILING ENTERTAIN DENTIST'S PATIENTS

Patients visiting one Boston dental office are entertained with moving pictures while the dentist works on their teeth. Children compose much of the doctor's practice, and he conceived the idea to attract the children, then found it so popular with grown-ups that he now gives a show for every patient. An inclined base was constructed for the projector which throws pictures on the ceiling. The picture is shifted to the point that will keep the patient's head in the best position for the doctor. Each picture runs for about twenty minutes, the average time a patient is in the chair. It was found that animated cartoons were best to make the patient relax and forget the discomforts. A young victim of infantile paralysis confined to a respiration machine also was entertained for weeks with the movies.

ROCK MADE BY PLANTS

Rocks which were formed centuries ago by lime deposits gathered by marine plants have been found in Glacier National Park, Montana. Especially large and abundant specimens of fossil plants have been uncovered, the marine growth belonging to a very ancient part of the world's history. Three new species of plants were found in the latest study of the rocks by two geologists, Dr. and Mrs. Carroll Lane Fenton.

*Journal of Geology
Copyrighted Material*

*16. Edgerwood Road
Belmont, Mass*

*Lawrence J. Carey
Boston, Mass*

*Same Service
1/8/32*

suggest United.

*A 2594
186*

POPULAR MECHANICS

Ballroom, 125, 13th Ave. New York

Cont. Assister Supt. Samuelford, Conn.



This Vender Made His Balloons into "Cats" by Painting Faces and Tying Up Corners for Ears

IDEA IS TURNED INTO MONEY BY BALLOON VENDER

How money often is made by the mere process of slightly altering some standard article is exemplified by the recent venture of a balloon vender. He found that the ordinary colored or tinted balloon needed some new feature to help it sell at the county fairs. He painted a cat's face on each balloon and tied up two corners, which, when inflated, looked like ears. The balloons quickly sold out.

MOTOR GAS EXTRACTS NICKEL AT LOW TEMPERATURE

Carbon monoxide, the deadly gas exhausted from automobiles, now is being used to extract pure nickel from filings, plating or ore as the result of a new process recently developed. The monoxide is passed at comparatively low temperature, about 100 degrees, through the metal source and led to another chamber where it is heated to about 150 degrees. The heating causes it to drop its load of metal which is deposited in the pure state. The gas is then cooled once more, passed again through the nickel ore and again heated. Thus is the cycle continued, the tank accumulating a supply of pure nickel with almost no temperature required. Nickel has an extremely high melting point. Since it is closely related chemically to

iron, after long experiment it was found the same process would work in refining the more common metal. The iron source, however, must be much hotter than the nickel. The iron, recovered in the form of black powder, is absolutely pure and melts at 1,200 degrees. Its greatest field of usefulness at present is in the form of medicine, which can be taken internally without modification or chemical treatment.

TWO-IN-ONE LOCK CAN BE FASTENED BY KEY OR COMBINATION

B. 36

One lock now being offered is opened either by a key or combination. It can be operated with

a key in the usual manner, or opened by plunging the correct combination. It is declared to be unpickable because pressure on the plungers is eliminated, and the one bolt acts both as a spring when the door is open and as a dead bolt when it is locked, making it impossible to insert flat-sided objects between the door and jamb to displace it. It is easy to install, only two circular holes being required, and is adjustable to any standard door. The lock can be changed from one combination to another in a few minutes, and is not a dial-operated device so it does not have to be worked in any particular order. When the door is closed, even if unlocked, anyone not knowing the combination will probably lock it if he tries to open the door, because, when any number except a combination number is punched, the combination automatically locks itself. If the key is mislaid or lost, the lock still can be operated with the combination.



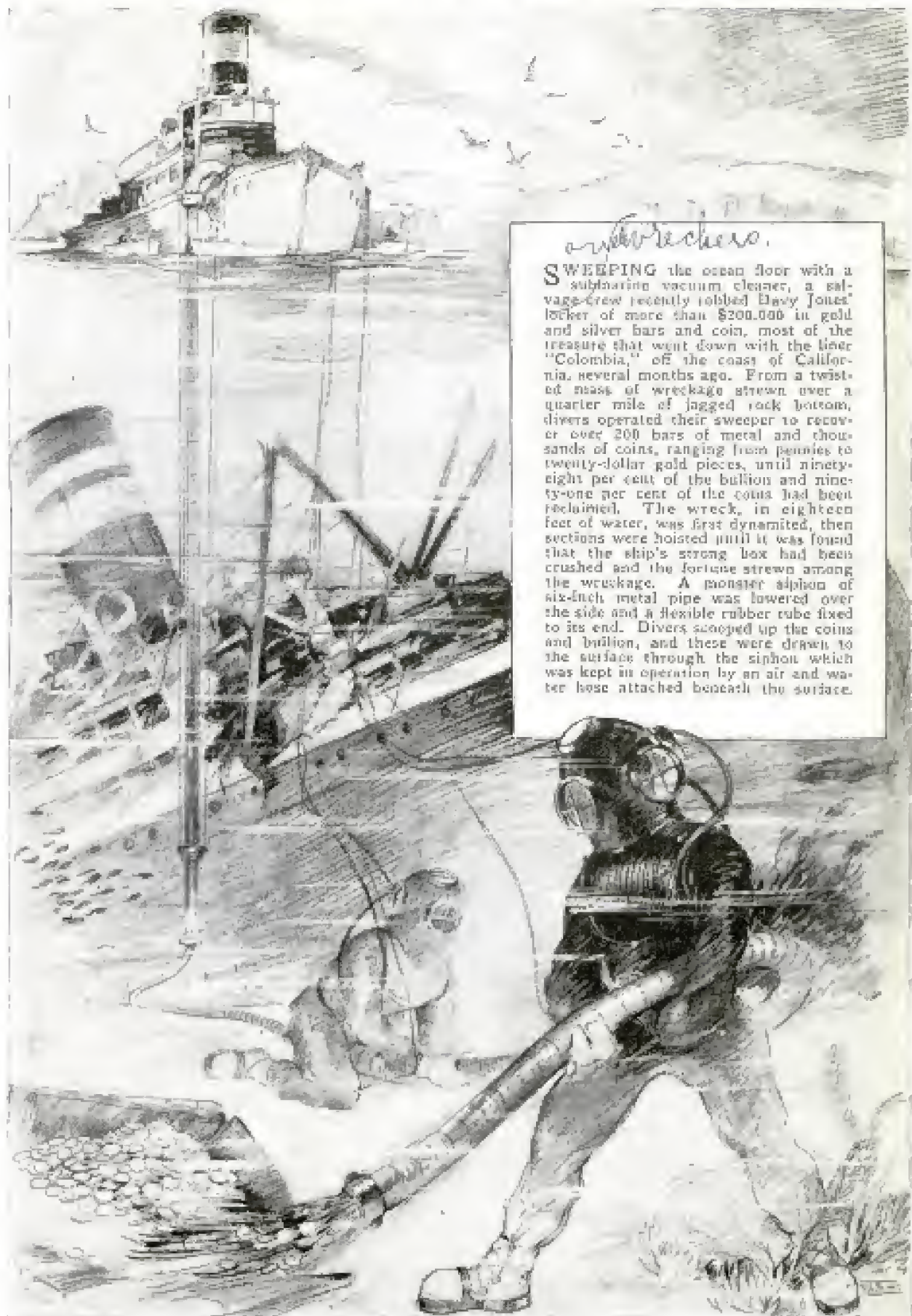
*mined Nickel Works, 3, Co 6 7 Wall St New York
in Wales, Great Britain
part of it extracted by*

*Hawthorne & Co
Sunderland, Calif*

*Cont. Louis Hurman Ray,
12 Erie St
Detroit Mich.*

*Easy to Lock Co
716 Chapman Bldg
Los Angeles, Calif.*

Vacuum Sweeper Recovers Sunken Treasure



on the wreck.

SWEEPING the ocean floor with a submarine vacuum cleaner, a salvage crew recently robbed Davy Jones' locker of more than \$200,000 in gold and silver bars and coin, most of the treasure that went down with the liner "Colombia," off the coast of California, several months ago. From a twisted mass of wreckage strewn over a quarter mile of jagged rock bottom, divers operated their sweeper to recover over 200 bars of metal and thousands of coins, ranging from pennies to twenty-dollar gold pieces, until ninety-eight per cent of the bullion and ninety-one per cent of the coins had been reclaimed. The wreck, in eighteen feet of water, was first dynamited, then sections were hoisted until it was found that the ship's strong box had been crushed and the fortune strewn among the wreckage. A monster siphon of six-inch metal pipe was lowered over the side and a flexible rubber tube fixed to its end. Divers scooped up the coins and bullion, and these were drawn to the surface through the siphon which was kept in operation by an air and water hose attached beneath the surface.



© Keystone View Co.
Indoor Swimming Pool in Paris—Which Has
Been Stocked with Game Fish to Attract
Winter Anglers

FISH IN SWIMMING POOL FOR WINTER ANGLERS

Paris. French anglers who like to pursue their sport in winter, but do not fancy the cold weather, are being attracted to an indoor swimming pool which has been converted into a fish pond. The large pool in Paris has been stocked with hundreds of pounds of fish,



and the angler pays a nominal sum for the privilege of fishing and for rental of rod and tackle. When leaving the pond, he submits his catch to be weighed and pays the market price for the fish. In the summer, the anglers take to the outdoors and the swimming pool is used for its original purpose.

TELEVISION ON BEAM OF LIGHT SEEN BY ELECTRIC EYE

Utilizing a wavelength of only a few billionths of a meter, television transmitted on a beam of light has been demonstrated successfully at the laboratories of the General Electric company. More distinct television pictures are confidently predicted, and while the work done so far is experimental, those engaged in it foresee the time when television will be broadcast from a powerful arc light mounted on top some tower in each city. The pick-up device is of the usual type, but instead of the impulses being fed into a radio transmitter, they are modulated into high frequencies on a light beam. The beam is projected the length of the laboratory and picked up by a photo-electric cell which transposes the light waves back into electric waves. The impulses then reproduce

the image by means of the ordinary television receiver. In its commercial application, it is expected the light waves will be picked up in each home by means of individual electric eyes instead of the present type of wire antenna. Since the light beam can be broadcast only for relatively short distances, probably ten miles, each community would have its own light-broadcasting system.

HONEY TURNED INTO CRYSTALS WILL KEEP INDEFINITELY

Honey, converted into crystal form under a new preserving method, will keep indefinitely when canned or placed in glass. The crystal honey is an opaque gray-white butter, does not drip, is not sticky and has a slightly different flavor. Liquid honey, under this process, is heat-

Schenectady, N.Y.

NY James 1/3/32

389

ed to about 160 degrees Fahrenheit in kill yeasts and molds. Then it is cooled to seventy-five degrees and five per cent of crystallized honey added. This small dose of crystals is like setting off a pack of fire-crackers. Honey crystals begin to grow everywhere in the liquid and to multiply rapidly. The mixture is brought to fifty-seven degrees, and within forty-eight hours the mass has turned to crystals. Honey naturally will revert to a crystal form, but often requires months or even years before the change is completed.

B. 3 4

All the safety of the autogyro and all the speed of an airplane are incorporated in an autogyro developed recently in England that will go as fast as a conventional type of plane powered by the same kind of motors. Despite its high speed in the air, the craft is able to ascend and descend almost vertically, thus greatly increasing the safety factor. The high-speed autogyro carries two passengers, and its 105-horsepower motor develops a top speed of 118 miles an hour and a cruising speed of 100 miles an hour. An autogyro has been made in this country that exceeds this speed, but it uses about three times the horsepower. The English craft has three rotor blades instead of four and they are of the cantilever type, without external supports. The fuselage is narrow, seating two persons tandem inside the cabin, and the streamlined shape is made possible by using a motor that has its cylinders in line, although they are air-cooled. Small fins are attached to either side of the tail, and a third wheel is fastened beneath the motor cowling to facilitate take-offs.

Cierva



Autogyro That Offers Both Speed and Safety; It Cruises at 100 Miles an Hour and Has a 105-Horsepower Motor

Don Juan de la Cueva
y Cueva Antiguero en England



By Crushing Stone Fences, Material for Paving Rural Roads Was Obtained by One Contractor

Abandoned stone fences have been turned into roads by a Maryland engineer using a portable stone crusher. The fences, many of which were built one hundred years ago, are regarded as antiquated by their owners. The engineer took his crusher into rural districts where roads were bad, crushed the stone fences and used the product for paving.

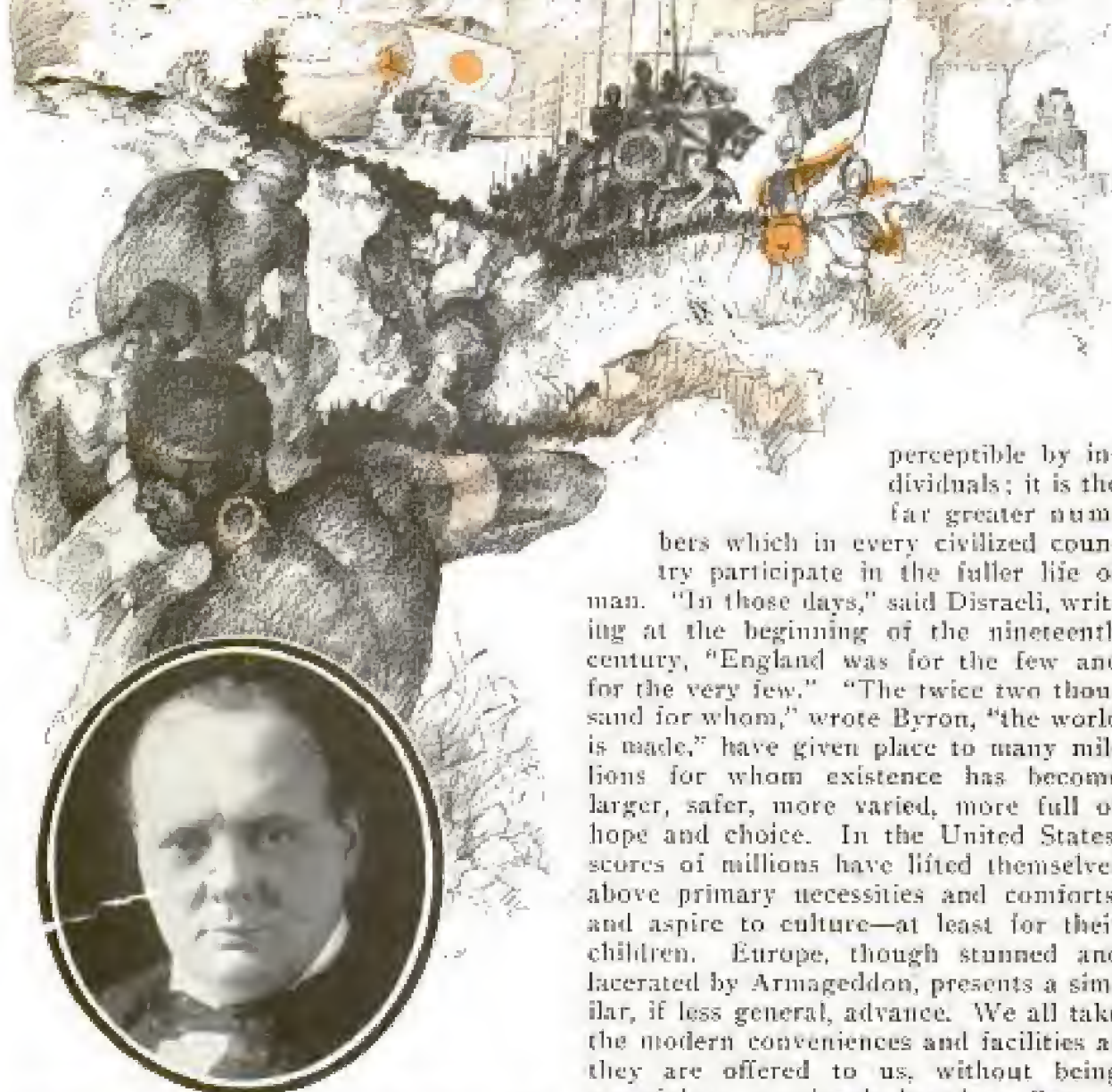
Building paper that stretches is now being used to compensate for the expansion of a structure due to temperature changes or external forces. Paper that is not elastic often is torn by such expansion, thus admitting cold and heat. The resilient paper is an asphalt product which will stretch fifteen per cent before breaking, but goes back to its former length when stress is removed. It is claimed it will stand a pull of forty pounds per linear inch, and a blow of 100 pounds is required to punch a hole one and one-half inches through it. When pulled and twisted, it clings to nails, thus making it virtually water-tight.

W. G. Charles &
 Cottonwood Triangle
 Co. North Platte, Neb.

A.250 B Curtis Brown, Ltd., 130 W. 42nd St.
New York

from The Strand, London, Eng.

FIFTY YEARS



Winston Churchill, Former British Chancellor of the Exchequer

THE great mass of human beings absorbed in the toils, cares and activities of life, are only dimly conscious of the pace at which mankind has begun to travel. We look back one hundred years and see that great changes have taken place. We look back fifty years and see that the speed is constantly quickening. This present century has witnessed an enormous revolution in material things, in scientific appliances, in political institutions, in manners and customs.

The greatest change of all is the least

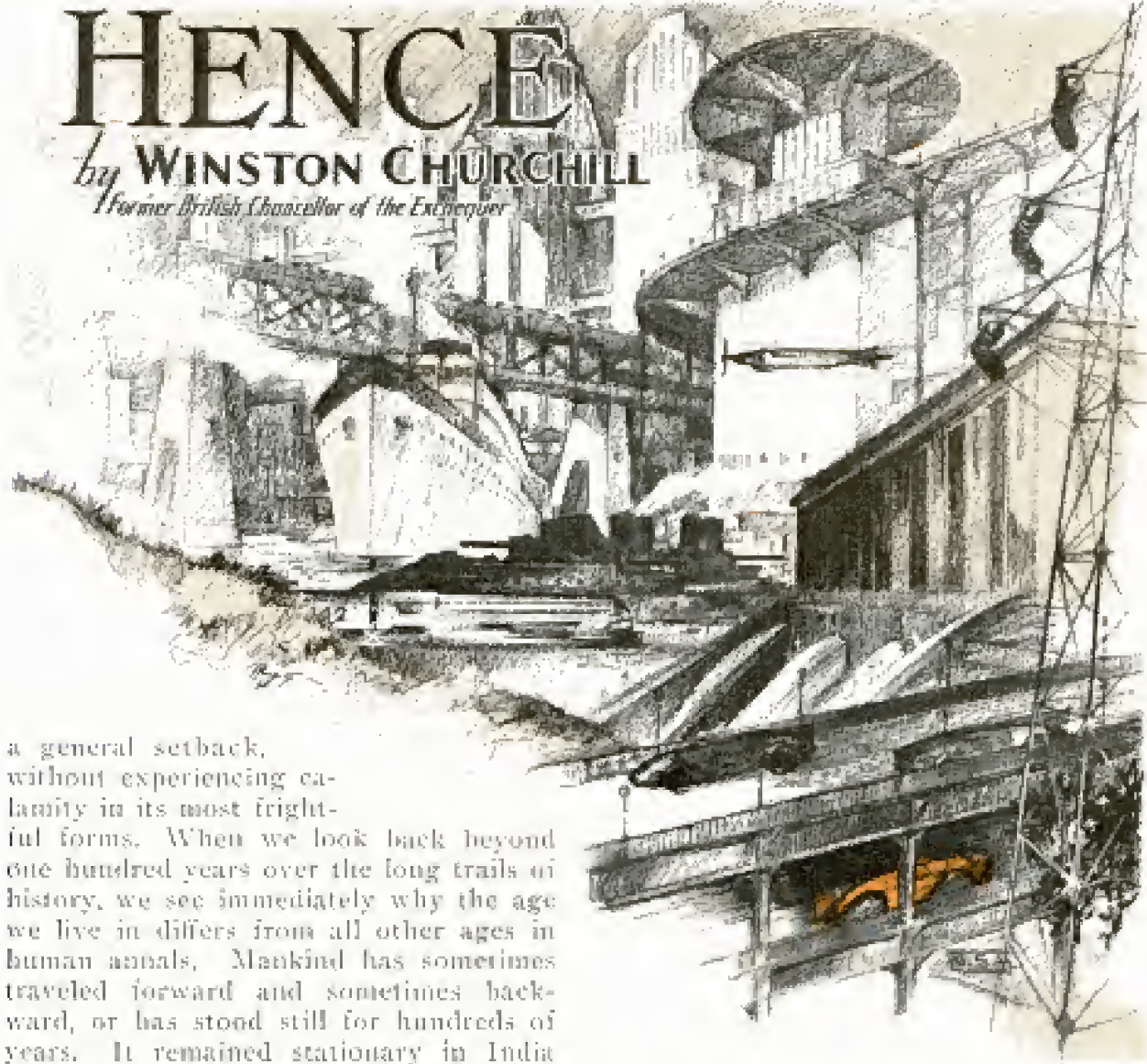
perceptible by individuals; it is the far greater numbers which in every civilized country participate in the fuller life of man. "In those days," said Disraeli, writing at the beginning of the nineteenth century, "England was for the few and for the very few." "The twice two thousand for whom," wrote Byron, "the world is made," have given place to many millions for whom existence has become larger, safer, more varied, more full of hope and choice. In the United States, scores of millions have lifted themselves above primary necessities and comforts, and aspire to culture—at least for their children. Europe, though stunned and lacerated by Armageddon, presents a similar, if less general, advance. We all take the modern conveniences and facilities as they are offered to us, without being grateful or consciously happier. But we simply could not live if they were taken away. We assume that progress will be constant.

"This 'ere progress," Mr. Wells makes one of his characters remark, "keeps going on. It's wonderful 'ow it keeps going on." It is also very fortunate; for if it stopped, or were reversed, there would be a catastrophe of unimaginable horror. Mankind has gone too far to go back, and is moving too fast to stop. There are too many people not merely whose comfort, but whose very existence is maintained by processes unknown a century ago, for us to afford even a temporary check, still less

HENCE

by WINSTON CHURCHILL

Former British Chancellor of the Exchequer



a general setback, without experiencing calamity in its most frightful forms. When we look back beyond one hundred years over the long trails of history, we see immediately why the age we live in differs from all other ages in human annals. Mankind has sometimes traveled forward and sometimes backward, or has stood still for hundreds of years. It remained stationary in India and in China for thousands of years. But now it is moving very fast.

What is it that has produced this new prodigious speed of man? Science is the cause. Her feeble groping fingers lifted here and there, often trampled underfoot, often frozen in isolation, have now become a vast organized, united, class-conscious army marching forward upon all the fronts toward objectives none may measure or define. It is a proud, ambitious army which cares nothing for all the laws that men have made; nothing for their most time-honored customs, or most dearly cherished beliefs, or deepest instincts. It is this power called science which has laid hold of us, conscripted us into its regiments and batteries, set us to work upon its highways and in its arsenals; rewarded us for our services, healed us when we were wounded, trained us when we were young, pensioned us when

we were worn out. None of the generations of men before the last two or three were ever gripped, for good or ill, and handled like this.

Man in the earliest stages lived alone and avoided his neighbors with as much anxiety, and probably as much reason, as he avoided the fierce flesh-eating beasts that shared his forests. With the introduction of domestic animals the advantages of co-operation and division of labor became manifest. In neolithic times, when cereals were produced and agriculture developed, the bleak hungry period, whilst the seeds were germinating beneath the soil, involved some form of capitalism and the recognition of those special rights of landed proprietors the traces of which are still visible in our legislation. Each stage involved new problems, legal, sociological and moral. But progress only

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cular efforts of all the inhabitants. Later empires, scarcely less imposing but far less stable, rose and fell. In the methods of production and communication, in the modes of getting food and exchanging goods, there was less change between the time of Sargon and the time of Louis XIV, than there has been between the accession of Queen Victoria and the present day. Darius could probably send a message from Susa to Sardis faster than Philip II could transmit an order from Madrid to Brussels. Sir Robert Peel, summoned in 1834 from Rome to form a government in London, took the same time as the Emperor

crawled, and often rested for a thousand years or so.

The two ribbon states in the valleys of the Nile and the Euphrates produced civilizations as full of pomp and circumstance, and more stable than any the world has ever known. Their autocracies and hierarchies were founded upon the control and distribution of water. The rulers held the people in an efficiency of despotism never equaled till Soviet Russia was born. They had only to cut off or stint the water in the canals to starve or subjugate rebellious provinces. This gave them powers at once as irresistible and capable of intimate regulation as the control of all food supplies gives to the Bolshevik commissars. Safe from internal trouble, they were vulnerable only to external attack.

But in these states man had not learnt to catalyze the forces of nature. The maximum power available was the sum of the mus-



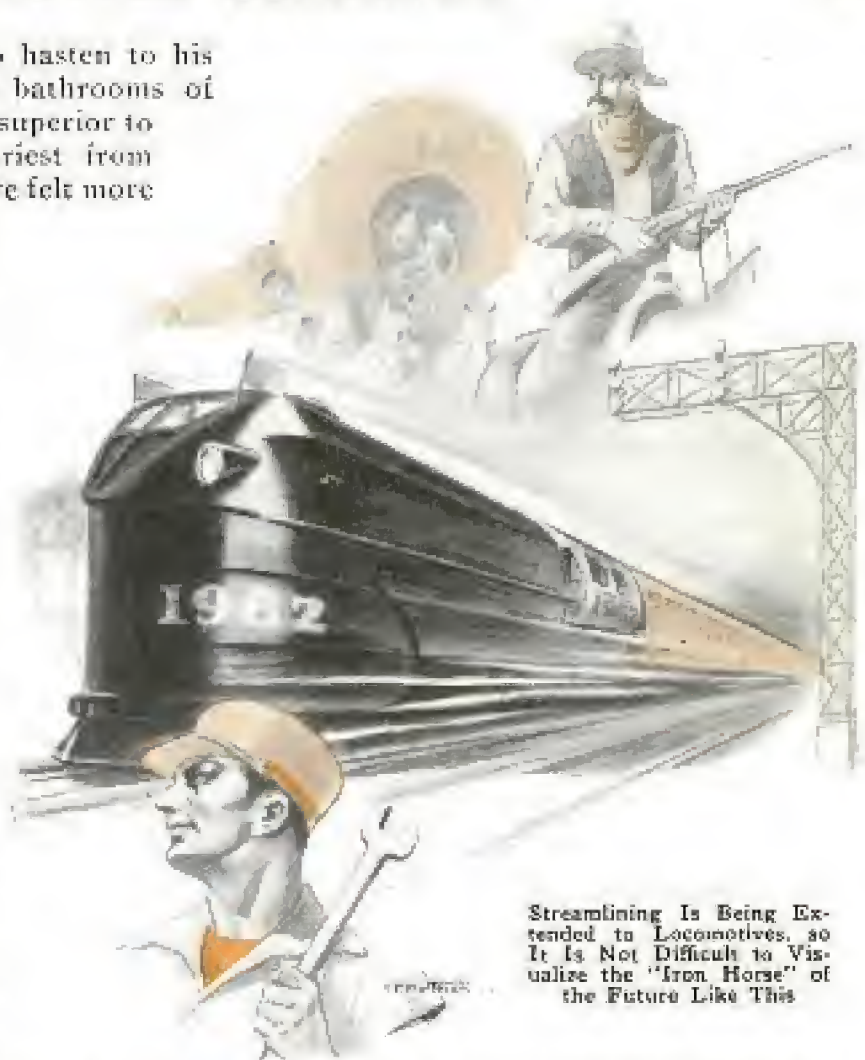
Television May Be Expected to Span Oceans and Continents to Conquer Distance as Radio Has Already Done

Vespasian when he had to hasten to his province of Britain. The bathrooms of the palaces of Minos were superior to those of Versailles. A priest from Thebes would probably have felt more at home at the council of Trent, two thousand years after Thebes had vanished, than Sir Isaac Newton at a modern undergraduate physical society, or George Stephenson in the Institute of Electrical Engineers. The changes have been so sudden and so gigantic, that no period in history can be compared with the last century. The past no longer enables us even dimly to measure the future.

There are two processes which we adopt consciously or unconsciously when we try to prophesy. We can seek a period in the past whose conditions resemble as closely as possible those of our day, and presume that the sequel to that period will, save for some minor alterations, be similar. Secondly, we can survey the general course of development in our immediate past, and endeavor to prolong it into the near future. The first is the method of the historian; the second that of the scientist. Only the second is open to us now, and this only in a partial sphere. By observing all that science has achieved in modern times, and the knowledge and power now in her possession, we can predict with some assurance the inventions and discoveries which will govern our future. We can but guess, peering through a glass darkly, what reactions these discoveries and their applications will produce upon the habits, the outlook and the spirit of men.

The most wonderful of all modern prophecies is found in Tennyson's "Locksley Hall:"

For I dipt into the future, far as
human eye could see,



Streamlining Is Being Extended to Locomotives, so It Is Not Difficult to Visualize the "Iron Horse" of the Future Like This

Saw the Vision of the World, and all
the wonder that would be;

Saw the heavens fill with commerce,
argosies of magic sails,
Pilots of the purple twilight, dropping
down with costly bales;

Heard the heavens fill with shouting,
and there rain'd a ghastly dew
From the nation's airy navies grappling
in the central blue;

Far along the world-wide whisper
of the south wind rushing warm,
With the standards of the peoples
plunging thro' the thunderstorm;

Till the war-drum throbb'd no longer,
and the battle-flags were furled
In the Parliament of man, the
federation of the world.

Slowly comes a hungry people, as a
lion, creeping nigher,
Glares at one that nods and winks
behind a slowly-dying fire.



Hidden Cities, and Even a Lost Civilization, May Be Discovered When Exploration of the Ocean Floor Is Made Easy

These six stanzas of prediction, written eighty years ago, have already been fulfilled. The conquest of the air for commerce and war, the world struggle of Armageddon, the League of Nations, the Bolshevik revolution—all divined in their true sequence by the great Victorian, all now already in the history books and stirring the world around us today. We may search the Scriptures in vain for such precise and swiftly vindicated forecasts of the future. Jeremiah and Isaiah dealt in dark and cryptic parables, pointing to remote events and capable of many varied interpretations from time to time. A Judge, a Prophet, a Redeemer would rise to save his chosen people; and from age to age the Jews asked disputing, "Art thou he that should come? or look we for another?" But "Locksley Hall" contains

an exact foretelling in their sequence of stupendous events, which many of those who knew the writer lived to see and endure! The dawn of the Victorian era opened the new period of man, and the genius of the poet cast back the curtains which veiled it.

Whereas, formerly, the utmost power that man could guide and control was a team of horses, or a galley full of slaves, or, possibly, if they could be sufficiently drilled and harnessed, a gang of laborers like the Israelites in Egypt, it is today already possible to control accurately from the bridge of a battle cruiser all the power of hundreds of thousands of men. Or to set off with one finger a mine capable in an instant of destroying the work of thousands of man-years. These changes are due to the substitution of molecular energy for muscular energy, and its direction and control by an elaborate, beauti-

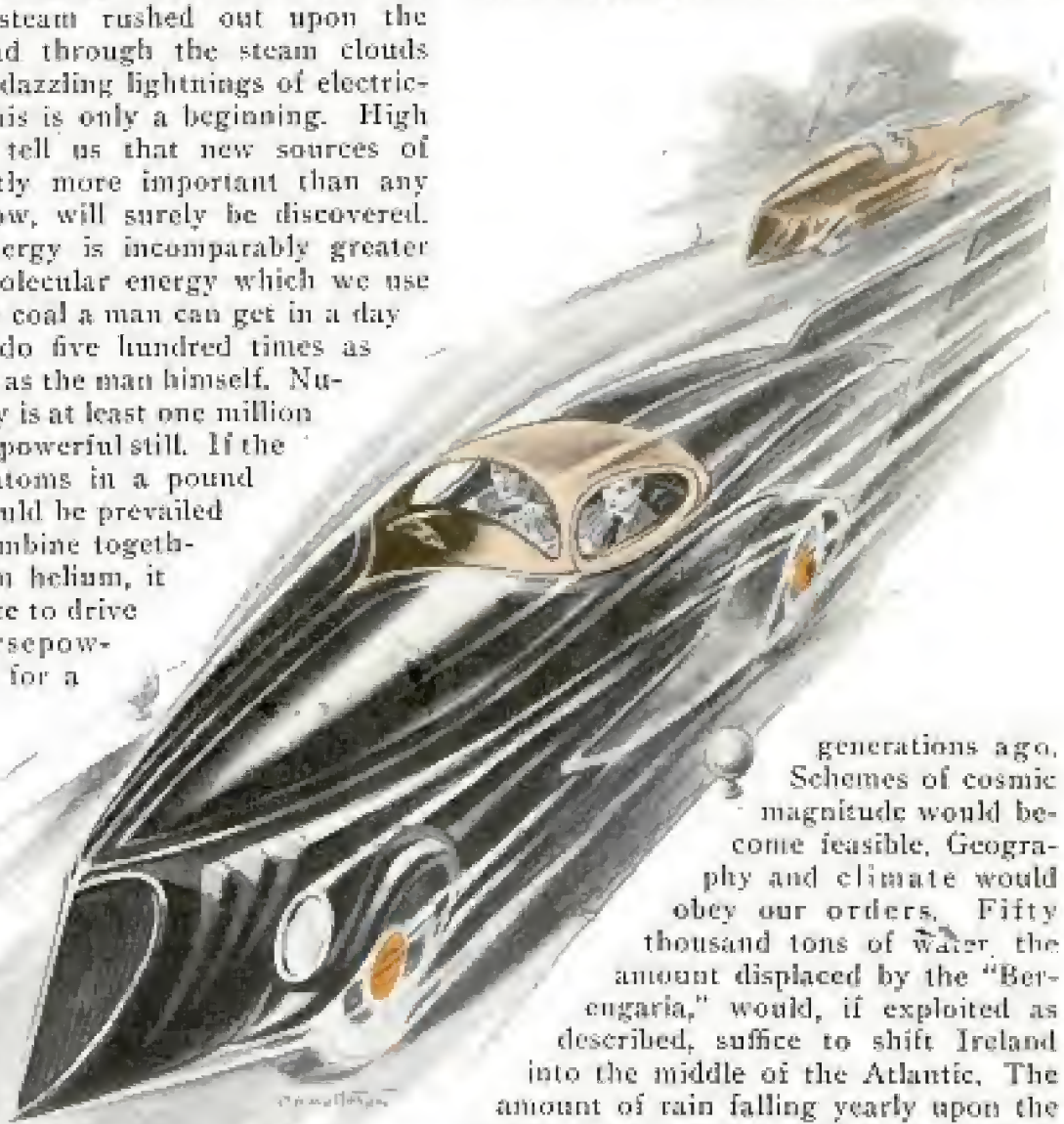
fully perfected apparatus. These immense new sources of power, and the fact that they can be wielded by a single individual, have made possible novel methods of mining and metallurgy, new modes of transport and undreamed-of machinery. These, in their turn, enable the molecular sources of power to be extended and used more efficiently. They facilitate also the improvement of ancient methods. They substitute the 100,000-kilowatt turbo-generators at Niagara for the mill wheel of our forefathers. Each invention acted and reacted on other inventions, and with ever-growing rapidity that vast structure of technical achievement was raised which separated the civilization of today from all that the past has known.

There is no doubt that this evolution will continue at an increasing rate. We

know enough to be sure that the scientific achievements of the next fifty years will be far greater, more rapid, and more surprising, than those we have already experienced. The slide lathe enabled machines of precision to be made, and the power of steam rushed out upon the world. And through the steam clouds flashed the dazzling lightnings of electricity. But this is only a beginning. High authorities tell us that new sources of power, vastly more important than any we yet know, will surely be discovered. Nuclear energy is incomparably greater than the molecular energy which we use today. The coal a man can get in a day can easily do five hundred times as much work as the man himself. Nuclear energy is at least one million times more powerful still. If the hydrogen atoms in a pound of water could be prevailed upon to combine together and form helium, it would suffice to drive a 1,000-horsepower engine for a

tonator to cause the dynamite to explode. The scientists are looking for this.

The discovery and control of such sources of power would cause changes in human affairs incomparably greater than those produced by the steam engine four



High-Speed Lanes on Highways Will Possibly Come with Further Evolution of Streamlined Cars

whole year. If the electrons—those tiny planets of the atomic systems—were induced to combine with the nuclei in the hydrogen, the horsepower liberated would be one hundred and twenty times greater still. There is no question among scientists that this gigantic source of energy exists. What is lacking is the match to set the bonfire alight, or it may be the de-

generations ago. Schemes of cosmic magnitude would become feasible. Geography and climate would obey our orders. Fifty thousand tons of water, the amount displaced by the "Bergengaria," would, if exploited as described, suffice to shift Ireland into the middle of the Atlantic. The amount of rain falling yearly upon the Epsom race course would be enough to thaw all the ice at the arctic and antarctic poles. The changing of one element into another, by means of temperatures and pressures far beyond our present reach, would transform beyond all description our standards of values. Materials thirty times stronger than the best steel would create engines fit to bridle the new forms of power. Communications and transport by land, water and air would take unimaginable forms if, as is in principle possible, we could make an engine of six hundred horsepower weighing twenty pounds and carrying fuel for a thousand hours in a tank the size of a fountain pen. Wireless



The Metropolis of the Future May Contain Set-Back Structures Like These and Elevated Streets

telephones and television, following naturally upon their present path of development, would enable their owner to connect up to any room similarly equipped and hear and take part in the conversation as well as if he put his head in through the window. The congregation of men in cities would become superfluous. It would rarely be necessary to call in person on any but the most intimate friends; but if so, excessively rapid means of communication would be at hand. There would be no more object in living in the same city with one's neighbor than there is today in living with him in the same house. The cities and the countryside would become indistinguishable. Every home would have its garden and its glade.

Up till recent times, the production of food has been the prime struggle of man. That war is won. There is no doubt that the civilized races can produce or procure all the food they require. Indeed, some of the problems which vex us today are due to the production of wheat by white men having exceeded their own needs, before yellow men, brown men and black men have learned to demand and become able to purchase a diet superior to rice. But food is at present obtained almost entirely from the energy of the sunlight. The radiation from the sun produces from the carbonic acid in the air more or less complicated carbon compounds which serve us in plants and vegetables. We use the latent chemical energy of these to keep our bodies warm, we convert it into muscular effort. We employ it in the complicated processes of digestion to repair and replace the wasted cells of our bodies. Many people, of course, prefer food in what the vegetarians call "the secondhand form," i.e., after it has been digested and converted into meat for us by domestic animals

POPULAR MECHANICS

kept for this purpose. In all these processes, however, ninety-nine parts of the solar energy are wasted for every part used.

Even without the new sources of power great improvements are probable here. Microbes, which at present convert the nitrogen of the air into the proteins by which animals live, will be fostered and made to work under controlled conditions, just as yeast is now. New strains of microbes will be developed and made to do a great deal of our chemistry for us. With a greater knowledge of what are called hormones, i.e., the chemical messengers in our blood, it will be possible to control growth. We shall escape the absurdity of growing a whole chicken in order to eat the breast or wing, by growing these parts separately under a suitable medium. Synthetic food will, of course, also be used in the future. Nor need the pleasures of the table be banished. That gloomy Utopia of tabloid meals need never be invaded. The new foods will be practically indistinguishable from the natural products from the outset, and any changes will be so gradual as to escape observation.

If the gigantic sources of power become available, food would be produced without recourse to sunlight. Vast cellars, in which artificial radiation is generated, may replace the cornfields and potato patches of the world. Parks and gardens will cover our pastures and plowed fields. When the time comes, there will be plenty of room for the cities to spread themselves.

But equally startling developments lie already just beyond our fingertips in the breeding of human beings and the shaping of human nature. It used to be said of



Ultraviolet Light May Result in Many Changes in Life Processes just as It Already Aids in the Treatment of Disease

scientific progress: "You have taught the dog more tricks; but you cannot alter the breed of the dog." But this is no longer true. A few years ago London was surprised by a play called "Rossum's Universal Robots." The production of such beings may well be possible within fifty years. They will not be made, but grown under glass. There seems little doubt that it will be possible to carry out the entire cycle which now leads to the birth of a child, in artificial surroundings. Interference with the mental development of such beings, expert suggestion and treatment in the earlier years, would produce beings specialized to thought or toil.



Electric Voice, Cello and Piano in the Studio during a Nation-Wide Broadcast of the Trio; the Music Is Produced Entirely by Electric Vibrations

ELECTRIC VOICE AND MUSIC ARE PUT ON THE AIR

Voice, cello and piano, each produced solely by electric vibrations, are being broadcast regularly over the Columbia network. The instruments operate on the principle of the "theremin" and are known as the electro-voice, the electro-cello and the electro-piano.

DOLLARS IN SCENTS SAVINGS BY CONTROL OF SMELLS

Chemical experts have discovered that from a standpoint of smell, there are two things that may be done with a manufactured product. An unpleasant odor may be neutralized or a pleasant odor may be added. For instance, in the manufacture of most laundry soaps strong-smelling chemicals are used, but this is usually covered up by adding perfume. In the silk industry many manufacturers use a small quantity of perfume to neutralize the odor of certain oils, gums and other ingredients. By using a little more perfume, any silk manufacturer may give his silk a

pleasant odor of its own. The idea of a scent control in industry is growing. The point has been reached in perfume chemistry where almost any such job may be accomplished without adding materially to the cost of the product. Chemists now analyze an unpleasant odor and find out what substance causes it. That substance is made part of the new odor. For example, some fly sprays, made of kerosene and pyrethrum powder, formerly were scented with five or six per cent oil of wintergreen. Now the chemists know eight or ten different substances that can be used in much smaller quantities. Research by the Dennison Manufacturing company, which makes lamp shades in which gelatin is used, revealed that in damp weather molds were likely to appear, causing black spots on the shades. They added a small percentage of phenol (carbolic acid) as a sterilizer, which settled the difficulty, but did not create an agreeable odor. They then discovered that many of the perfumes used by scent experts are as effective disinfectants as is phenol. They now use perfume materials for sterilizing their

Cont. Harry K. Hobart, 71, Albemarle Ave.
Hempstead, L. I. New York

Bureau of Chemical Research, Dept. of Agriculture
A. 2585 Stromberg
Motocoped Co
POPULAR MECHANICS
1145 Riverside Parkway
Chicago
 399

shades. In one large hospital, white uniforms and the like are sterilized with aromatic products. Several manufacturers are now adding a trace of odor to silk stockings. One leading auto maker perfumes his upholstery. Statistics show that one man out of every six is color-blind, and it is believed that the percentage of those who are insensible to smell is not any greater. Men like spicy odors, women do not. E. C. Crocker and L. F. Henderson are two government chemists and pioneer perfume experts. At present they are engaged in working on odors that cancel each other. These experts declare that the keenest human sense of smell is negligible as compared with that of insects. The United States government is now buying several thousand pounds of geraniol every year. This has a rose odor, and it attracts Japanese beetles a mile away. When they arrive at the source of the odor they are exterminated. Crocker and Henderson have tentatively divided all odors into four elementary odor sensations: fragrant, acid or sour, burnt and caprylic, which means goatlike.



Anti-Track 1975
 This Portable Track Makes Car Pull Itself Out of Snow, Mud or Sand

AUTO CARRIES ITS OWN TRACK TO PULL IT FROM SNOW

Snow, mud or sand-bound motorists now can pull out of the impediment by a simple device that is carried right in the car. It consists of a matlike track, with a corrugated surface, that can be laid on the roadway in front of the rear wheels. As soon as the wheels start spinning, the corrugated surface takes up the traction and the car moves away. The track is light and easily stowed in the auto.

STOP GAS FIRES ON BOATS WITH BILGE SOLVENT

Gasoline and oil in the bilge of a boat constitute a fire hazard in case of a back-fire or short circuit, so one manufacturer has placed on the market a bilge solvent intended to neutralize this inflammable material. A few handfuls of the solvent not only keep the bilge free of grease and oil, but remove the musty, stagnant odor as well. It is effective in all waters, dissolves completely and is harmless, the makers claim.

Plunging In and Out of Three-Foot Pit Is One Test for Trucks



Scannell Lorries, Ltd
Watford, West. Yorks.
England

Puro Products Co
2602 Payne
Art. Cleveland

Chicago & nationally magazine
1 Safety City & n wells

**GLASS HOUSES ON
BRIDGE OFFER
CITY VIEW**

Twin pergolas of glass are planned for the two steel towers on top of the Washington Memorial bridge in New York for service as observation towers. The steel framework above the points where the great cables are supported will be glassed in, express elevators installed to carry tourists 635 feet above the water, and sandwich and coffee shops, lounge chairs and radio equipment placed in the area. An open-air promenade will be provided, with the usual telescopes. It is expected that the profit from the towers will add about \$200,000 yearly to the revenue of the port authority, and that the towers will develop rapidly into full-fledged rivals of the Empire State and Chrysler buildings.

**EXPANDER STOPS
PISTON SLAP**

Piston slap in your automobile engine can be stopped permanently by installation of adjustable

expanders now on the market. The expanders fit any piston up to four inches in diameter and can be installed in all split-skirt-type pistons. Adjustable to take up space wherever wear occurs, the expanders meet a demand for something to end motor noises in used cars. The device presses the sides of the piston against the cylinder wall by means of a nut-and-screw arrangement.



Testing a Balloon That Can Be Guided and Propelled by the Passenger, Who Manipulates the Gas Bag from His Perch beneath It

**BALLOON CAN BE GUIDED IN AIR
AND PROPELLED BY FLYER**

Balloonists have always been handicapped because they have been unable to control the gas bag once it was aloft, but a Greek engineer has invented a balloon which can be both guided and propelled by the operator. The flyer sits in a frame suspended beneath the bag from which he manipulates the propulsion mechanism and the steering apparatus.

☛The United States shipping board, with a fleet of 2,239,153 gross tons in 397 vessels, is the world's largest ship owner.

Bureau of Navigation

*John E. Hobbs Co. 752
162 N. Franklin
Chicago*
Copyrighted material

John Kaimis, Island of Corfu, Greece!

M. D. Jones 12/24/31

A2590

Acme

A2567

PLANE SHOT OVER WATERFALL TO MAKE IT TAKE AIR

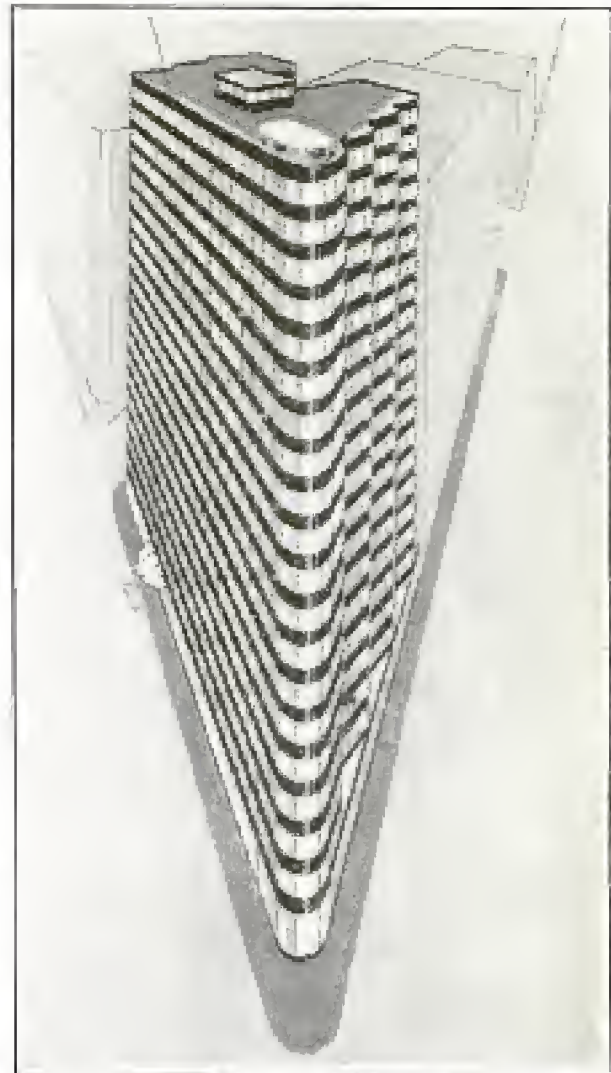
One of the most dangerous and thrilling take-offs in the history of aviation was recorded recently by a geologist and his mechanic upon their return from northern Saskatchewan where they had been forced down on a small lake on an exploring trip. A piston was broken, which they repaired as best they could with native copper found on the shore. Attempts to take off, however, were vain, as the crippled engine had not sufficient power. Cruising over the lake, they discovered a 400-foot waterfall at one end. At its base were trees in a rock-studded ravine. Taxiing back to the opposite end, they raced the plane with all the speed it would master over the waterfall. It dropped sickeningly for about half the distance of the fall, then took the air slowly and the explorers were able to return to within a few miles of their base.

AUTOMATIC TUNING FOR RADIO BRINGS IN PROGRAMS

Your radio favorites for the entire day can be tuned in when you get up by the use of a program selector attached to the set. With the automatic tuner, any fifteen-minute program can be preselected from one of six stations throughout a twelve-hour period. When the time for any program arrives, the device turns on the set, tuned to the proper station.



Radio-Program Selector Which Can Be Set to Bring in Favorite Programs from Various Stations for a Twelve-Hour Period



Walls of Metal to Reduce Weight and Cost of Buildings; One Architect Submits Above Drawing

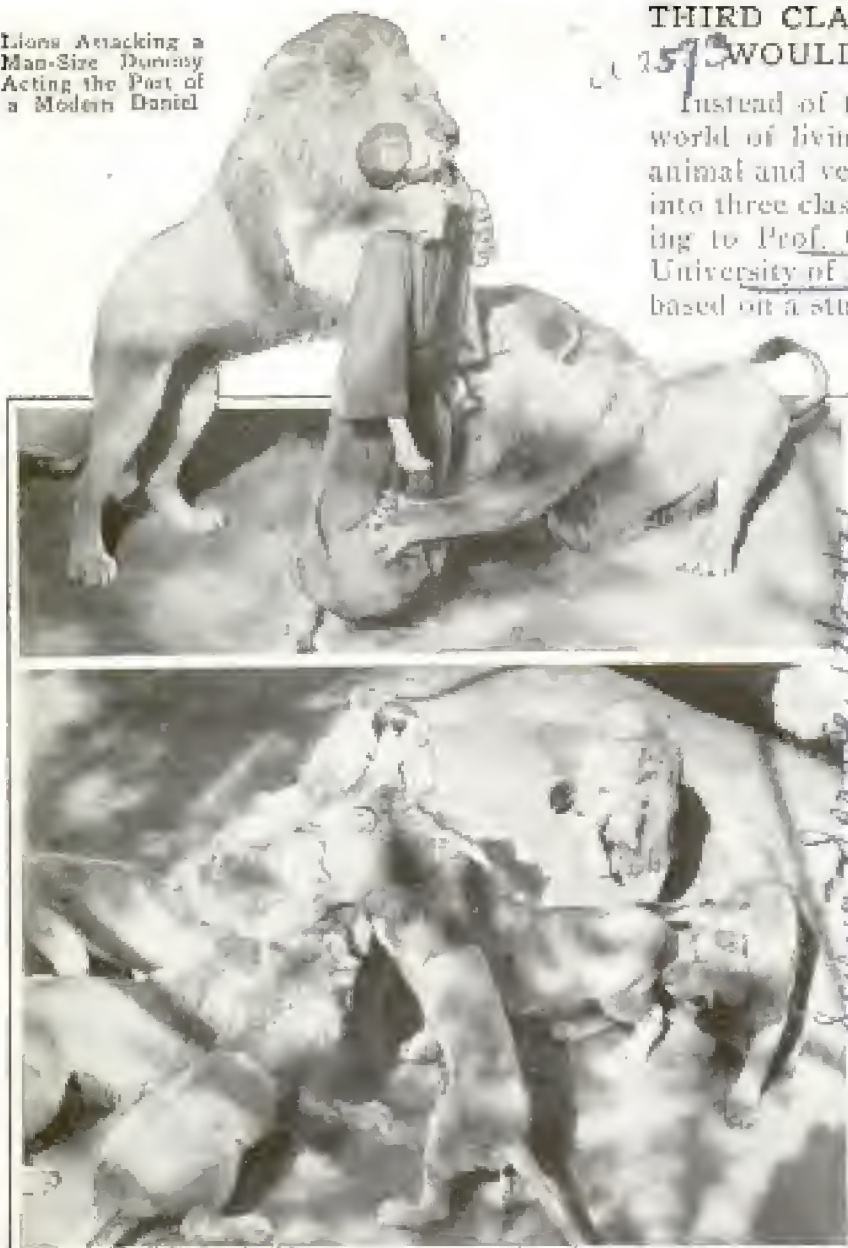
METAL WALLS FOR BUILDINGS TO LOWER COSTS

Metal walls give great strength with small thickness, reducing the weight and cost of buildings. One Chicago firm of architects, which expects to erect six all-metal buildings in 1932, points out that an exterior wall only three inches thick is necessary. The insulation may be of cork, rock wool or other materials, and the interior finish may be applied in the factory directly to the insulation on the inside of each wall slab. An interior wall finish, such as linoleum, can be used, eliminating the necessity of plastering. A three-inch wall of this type will have about one-tenth the weight of a masonry wall and about three times the insulation value. The metal units may be shop fabricated and erected quickly on the job, saving a great deal of labor.

Downman Bros. & Co. Architects
952 N. Michigan Ave. Chicago

Wide World
No answer maker and
inventor unknown

Lions Attacking a Man-Size Dummy Acting the Part of a Modern Daniel



DUMMY "DANIEL" SHOWS FATE OF MAN IN LION'S DEN

Curious to know what would happen to a modern Daniel in a lion den, a photographer rigged up a man-size dummy on a California lion farm. Then he trained his camera on the dummy as twenty beasts of the jungle were turned loose in the inclosure. The dummy actor lasted about thirty seconds, the first lion taking off the head at one bite, the second snatching an arm, and the rest helping themselves to the shreds that remained.

It is estimated that 557,400,000 incandescent lamps were sold in the United States in 1931.

John Liston, General
Electric Review

THIRD CLASS OF LIVING THINGS WOULD INCLUDE FUNGI

Instead of the ordinary division of the world of living things into two sections, animal and vegetable, it should be divided into three classes to include fungi, according to Prof. G. W. Martin, of the State University of Iowa whose conclusions are based on a study of the slime molds, creatures very low in the scale of life, that have been regarded variously as animals and fungi. He holds that the theory that plants and animals are all descended from a single original cell is not necessarily the case at all, but that it is more probable that life originated from several independent sources, widely separated in both space and time. Thus there would be no necessity for forcing such unlike things as green plants and fungi into each other's company, which is now done mainly because of the idea of a common descent.

FILE RUBBER GRIP PROTECTS HANDS

For protection of the user's hands, a soft-rubber grip that fits over the end of files has been developed. The grip is shaped to fit snugly inside the palm, and makes it easy to hold the file flat and apply the proper pressure, preventing scars on the work. It also serves as a shock absorber if the file is dropped and is available for all file sizes.



Rubber Grips for Files Enable the User to Do Better Work and Protect His Hands

J. L. Alsgood Tool Co.

43. Pearl Street
Buffalo, N.Y.

Calif. Lion Farm, El Monte, Calif.

A2593

Class City dams

A2446

THIRTEEN-DAY NON-STOP TRIP

TESTS DIESEL TRUCK

Thirteen days without a stop was the test run of a Diesel-engined truck recently. The engine ran continuously fourteen days, while the truck was driven one day less in its non-stop journey, one wheel becoming loose after the first day's run. The truck was driven 10,005 miles without refueling and 13,535 miles without stopping. The total cost at an average speed of forty-three miles per hour was \$75.54, or about one-half cent per mile. The run was staged at the Indianapolis speedway. The two and one-half ton truck, with a total weight of 21,000 pounds, was overloaded at the start, when 908 gallons of fuel were aboard, but the truck averaged ten miles to the gallon of fuel and 1,825 miles per gallon of lubricating oil. The Diesel engine used on the run has no spark plugs and no carburetor. The fuel oil, much the same as that used in the household furnace, is heated and injected into the cylinders in the form of vapor. The heat generated by the compression of pure air in the cylinders ignites the vapor. Otherwise the engine does not differ in its movements from the ordinary gasoline engine. Top speed of the truck is sixty-five miles an hour.

WHITE ROSE IS COLORED GRAY WITH DYE FOR MOURNING

Artificial coloring has been used in producing a gray rose for mourning purposes. White roses treated with an aniline dye, naphthol black B, take on a delicate gray or grayish-black hue without affecting the odor. The dye is worked into the rose by placing the stems in a solution of coloring matter. The same process may be used in darkening and intensifying the colors of flowers in which the natural tint is faint. Life of the flower is unaffected, the roses keeping as well as if they had not been treated. One-eighth ounce of dye dissolved in a pint of water is effective, while the solution may be diluted ten times without losing its strength. The color begins to appear in the rose ten or fifteen minutes later. Carnations grown in sand will absorb dye fed through the roots, but experiments with other flowers have been only partly successful.



Figures Dangling in Air as Interest-Catchers; Lifelike Appearance Attracted Thousands

FIGURES DANGLING ON LADDER DRAW CROWDS

Figures dangling from a rope ladder suspended high in the air drew throngs of curious to a department store in Milan, Italy. The figures were extremely lifelike dummies and were placed on the ladder in various acrobatic poses. The ladder, in turn, was suspended from a huge packing case, swung from the building cornice. Thousands of persons were astonished at the display, stopping to discuss it.

Mr. Henry Kraemer

GET



The Cameraman Follows the Explorer and Adventurer to the Far Corners of the World; Here Is Robert Donahue, Newsreel Photographer, Who Went to the North Pole with Admiral Byrd

By E. C. SCHNURMACHER

22 8 69 M

"ZUNI Indians, snowbound and freezing to death in blizzard, north of Gallup, New Mex." Over the teletype, this brief graphic dispatch reaches the news desk of the Universal office in New York. Its receipt galvanizes Samuel Jacobson, newsreel editor, into action.

He glances at pins set in a big map on the wall above him. The nearest pin to Gallup is set in Los Angeles, Calif. That pin represents Leroy A. Mervyn, one of Universal's 500 cameramen. Jacobson picks up the telephone and calls Los Angeles.

"Get the story!" is his terse command. Expense, danger, hardship, and all other obstacles, must be waved aside. The rescue of those Indians must be filmed, and the cameraman must be the first on the spot. A newspaper reporter can reconstruct a story from reports of eyewitnesses, but the greedy lens of the newsreel camera must be an eyewitness itself.

Fifteen minutes after receiving the call, Mervyn is on his way to the Los Angeles airport with his camera. A swift airplane

flies ~~from Los Angeles~~ ^{from Gallup} Over Albuquerque a bad storm develops that the plane cannot buck. It lands. Within an hour, Mervyn is on his way again in a fast automobile. The storm gets worse. He does not reach Gallup until the following day.

No time to rest. The rescue party has set out three hours before. They cannot average much over a mile an hour breaking trail with their horses and sleds. Eighteen miles—nearly eighteen hours through snow and ice. Mervyn hires a guide, a horse and a sled. Then he starts out after the rescue party. Hours later he catches up to them. Later still, he films the actual rescue of the Indian woodchoppers and nutpickers. His job is half done.

Wearily he retraces his way to Gallup, arriving there before the rescue party. The plane he left at Albuquerque has finally come through, refueled, and is waiting for him. He delivers the precious negative to the pilot and the latter starts winging his way east toward New York.

Then and only then, Mervyn wires the New York office. He has spent three full

the Story!

They Risk Their
Lives To Live



days and nearly \$2,000 making a bit of news-reel which, three days hence, will run for exactly one minute and forty seconds.

A staff car is waiting for the pilot at Newark airport. The film is taken swiftly to the synchronization and developing plant at Camden, N. J. Mr. Jacobson and Graham McNamee, the talking reporter, are there to receive it. The film is quickly developed

and projected. After seeing it once, Mr. McNamee is ready to "put it into sound." With a microphone in front of him, he gives a running description of the action on the screen, carefully timing himself to finish when the picture does.

The master negative is now ready for making hundreds of prints which will be sent all over America and to eighteen foreign coun-

Cameramen Working under Difficulties from
Aquaplane, Airplane and Yacht

Q2552



tries. At the same time, clips, or cuttings, have been made of the most graphic pictures. These are enlarged and rushed to news-picture syndicates, whose men sell them to the newspapers. A single picture, appearing in one metropolitan daily paper, may cost that newspaper as much as \$300.

It is rarely that a newsreel cameraman gets into print. It is only when some tragedy occurs in which he is killed, that a brief notice appears in the newspapers. Such an event, for example, as when the racing driver, Lee Bible, was killed at Daytona Beach, Fla., and his car, running amuck, killed the cameraman that was filming him.

Where do the newsreel cameramen come from? Percy Howard, newsreel editor for Pathe, and the first newsreel editor to introduce sound news, answers that question.

"About sixty per cent

of the newsreel cameramen," said Mr. Howard, "are recruited from the ranks of the newspaper still photographers. In fact, many of the production staff of the Big Four, Pathe, Paramount, Universal and Fox Movietone were formerly newspapermen.

"The other forty per cent grow up from office boys in the newsreel offices. These lads, 'punks' as they are called, carry batteries and equipment on their holidays and spend as much time with the cameramen as they can.

"There are two kinds of newsreel men, the chap who can bring in a first-rate news story and the pictorial specialist. Each is important, and it is virtually impossible to find one man who combines both these qualities."

Universal Newsreel is the only one of the four big newsreel companies that does not have sound units, preferring to synchronize the sound at the laboratory after the picture has been taken. The

unit, which is moved in a fast truck, consists of

a sound cameraman, a silent cameraman, a sound man and a contact man.

The sound cameraman and the sound man work together. The sound camera, electrically operated,



Top, Modern Sound Camera; Center, Spectacular Stunts, Once Popular, Have Been Discarded for News; Below, Tiger Shark Filmed and Then Caught



Newsreel Men Using Rowboat in Indoor Swimming Pool to Photograph Helen Madison, Swimming Champion; She Swam for Two Hours and They Got Pictures Lasting Forty Seconds on the Screen

is synchronized with the recording apparatus through a control box operated by the sound man who sets up the mike wherever it is most advantageous.

The sound man is generally recruited from the ranks of the radio engineers. His job is often difficult but seldom so dangerous as the newsreel cameraman's. He has to be ingenious and have a thorough knowledge of the mechanics of sound and acoustics, plus a sixth sense to make the sound plausible. As an example of this, a sound cameraman recently made a picture of a speeding motorboat. While the boat was quite far away from the camera, the newsreel man had no difficulty in "pulling it in" with a telephoto lens on his camera. The sound man could not resort to any such expedient. He solved his problem by engaging another boat which was tied to the dock in front of the microphone, its motor running at racing speed.

The contact man occupies an important function. It is his job to see that things run smoothly, and his duties vary from arranging camera interviews with royalty

to carrying the batteries connected to the sound-recording apparatus. He generally is a cameraman too, and takes his turn with the slow or stop-motion camera to secure additional "angleshots."

When sound was first introduced to newsreels about four years ago with a reel of Lindbergh's take-off for Paris, sound trucks were cumbersome and equipment weighed about 1,000 pounds. Many refinements have been introduced and equipment now weighs considerably less than half of that, and is so portable that it may be taken in airplanes. A sound-camera outfit costs between \$35,000 and \$50,000. A silent newsreel camera costs \$1,000 to \$5,000.

Not only does a newsreel cameraman have to face dangers incidental to the story he is filming, he must also contend with competition. Rival cameramen will go to any lengths to prevent a scoop.

"At all important points, whether here or abroad," said Editor Howard of Pathe, "the newsreel companies maintain tipsters, who phone or wire in when an important story is about to break. At Langley field,



Top, Photographers on Way to Cover Mountain-Lion Hunt; Below, Shooting Fight between Police and a Criminal Cornered in New York

Va., for example, it is virtually impossible for a newsreel cameraman to secure a scoop, for in so important a flying center all of the newsreel companies maintain tipsters.

"Once in a while it is possible to 'sew a story up tight.' When Post and Gatty made their epochal round-the-world flight, they had one of our newsreel cameras along. Naturally we had to take every

precaution to see that the film was not stolen at any port of call."

Film is sometimes stolen, hijacked or spoiled. When rival cameramen flew to Murray bay to film the "Bremen" many blows were struck. This situation also has its humorous side. Joe Gibson, Universal cameraman, covers with his silent newsreel camera many stories covered by sound units. When Mr. Gibson starts to grind his camera in slow motion, it emits such a high, whining tone that the sound cameramen have to stop and the noise



The Newsreels Go after Celebrities; Here Is the Prince of Wales before the Camera

will not be recorded in their microphones.

During the war, several newsreel cameramen were killed filming action from the front-line trenches. In peacetime, they take just as many chances. One of the most dangerous exploits of a newsreel cameraman occurred very recently when Pathe filmed a story in which a pouch of mail was taken by a small dirigible from the top of the Empire State building in New York to a ship at sea.

Only a single door on one side of the dirigible could be opened, and it was necessary for the pilot to use that to lower a rope for the mail pouch. To accommodate the cameraman, a large canvas bag was attached to the landing wheel beneath the dirigible and the action was



Photographer Climbing Unfinished Building to Get Picture from the Dome, Shown in Inset

speed record. Pictures were made of the first try. On the following day, while the cameramen were gathered at the hotel waiting for the rain to stop, Bayles announced that he would try again. With their film "in the can," the other cameramen scoffed at the idea of shooting the same story over again in the rain.

That sixth sense pricked Traynham. He was the only cameraman on the spot to shoot the fatal accident, securing a remarkable though harrowing picture. He was so close to the scene that he was sprinkled with flaming gasoline from the wrecked plane and had to roll on the ground to put out the fire in his clothing.

The pictorial-newsreel cameraman has danger to face as well as the news cameraman. He, too, goes to the far places and frequently has to pitch in and help the story along when it gets too much "atmosphere" and too little fiction. One member of a Grantland Rice Sportlight unit in Florida, filming a fishing story of the Everglades, recently jumped into the water and wrestled with an alligator to make the story more interesting.

In another pictorial bit, a number of automobiles of ancient vintage were filmed in a race. In order to make a better picture, a member of the unit, unknown to the contestant, placed a rocket in the exhaust of his car and touched it

off. The look of amazement and consternation on the face of the contestant when the rocket went off made a very entertaining incident of the story.

With the passing of the years, the dangerous work of the newsreel man is taking on historic as well as news importance. Such events as the Dayton flood of 1913, Roosevelt in Africa in 1910, the Irish Free State rebellion in 1923, the Japanese fire and earthquake in 1926, and thousands more, in which the newsreel cameramen played daring parts, are now preserved in newsreel archives which will be available to historians of centuries to come.

As for the newsreel cameraman himself, he is the man behind the camera much preferring to remain in personal obscurity, but scorning every danger to heed the first mandate of the newsreel editor—"GET THE STORY!"



FIRE FIGHTING WITH CAMERA HELPS TEACH EFFICIENCY

Movie cameras mounted on motorcycles now rush to each fire to which apparatus is called in Paris, and the whole conflagration is filmed for future study. Fire-department heads and the firemen themselves study the films later in an effort to locate points of procedure by which the fire could have been more quickly or completely smothered.

SUN FOUND JUST A WEAKLING COMPARED TO FAR STARS

As a luminary, the sun that warms and lights the earth has been found a veritable weakling compared with stars 5,000 and 10,000 times as brilliant. Exact brilliancy measurements of 5,000 stars that can be seen with the naked eye have been completed after two and a half years of study by Dr. Gustaf Stromberg of the Mount Wilson observatory. While some of these

stars are found to be so much brighter than the sun as to be almost inconceivable, Doctor Stromberg also found some sixteen times fainter, but still visible. All values are obtained by imagining the stars to be at the same distance from the earth as the sun. In addition to brilliancy measurements, Doctor Stromberg calculated the total amount of heat given off by each star per second and found that if the measurements varied, the star was unstable and likely to explode. Sometimes the "pulsating" star splits in two, thus explaining the double stars that always have been a puzzle.

GREENHOUSE THAT BRINGS PLANTS TO BUYERS

Flowers growing in an actual, if miniature, greenhouse now are being taken right where the crowds are and there plucked and sold, by means of a trailer which can be taken by car any-

where there is a road. The greenhouse is fitted with double glass windows and roof and can be connected to any convenient power outlet to operate the heaters or refrigerating units. In addition to flowers, plants, bulbs, seeds, shrubs and novelties, the "super show window" can be employed for the sale of green vegetables. In very cold weather, the salesman can take the customer into the greenhouse,



Super-Showroom for Florists That Takes the Plants to the Customer While Still Growing

national greenhouse
My Co. Pana, Ill.

DELPHIC ORACLE'S BASE IS FOUND IN TEMPLE

Identification of a slab of limestone found in the Temple of Apollo as part of the equipment used for the famous Delphic oracle has been made by Dr. Leicester B. Holland. The stone served as a base for the oracle. Its area is divided into two parts. In one section are holes, obviously for the attachment of three legs and central support of a metal tripod. The priestess who breathed the intoxicating vapor and who spoke the inspired messages is known to have been seated upon a tripod. There are two more holes in the slab, on opposite sides of the tripod base. These, Doctor Holland says, may have held rods or may have been openings through which sprang laurel boughs of real or metal foliage which the priestess shook as she prophesied in her frenzy. Straight down through the stone runs a hole through which Doctor Holland believes the inspiring vapor or fumes were made to rise about the priestess' head. While the ancients believed the fumes issued from a hole in the earth, Doctor Holland points out that there is no such hole beneath the temple and is of the opinion that the fumes were artificial. Possibly pine and laurel were used, with hemp seed, to produce a form of intoxication.

BLIND FLYING FOR AIR LINERS TO SAVE TIME

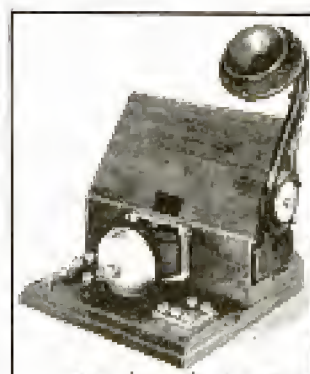
Pilots of large transport planes are now able to fly "blind" with the aid of the same instruments that enable the pilots of smaller ships to stay on their course without exterior visibility. Three such devices have recently been tested for transport ships, each of them playing a part in indicating constantly to the pilot the course of the craft in flight. All were found to operate successfully on the larger planes, thus enabling the flyer of a big plane to



Some of the Many Instruments on the Panel of a Transport Plane Which Enable the Pilots of These Large Ships to Fly Blind

perform many maneuvers without glancing from his instruments. One of the aids to blind flying tried for transports is the Sperry directional gyro, a navigating instrument to show the compass course of the craft. It does not oscillate in rough air like the magnetic compass. Another gauge is an altimeter with two hands like a clock, one indicating thousands and the other hundreds of feet, giving the flyer a closer check on his actual altitude. The third aid is the Sperry horizon, giving the position of the craft with relation to the actual horizon.

ORIGINAL EDISON PHONE MODEL IS PUT ON EXHIBITION



An original experimental model of the telephone, designed by the late Thomas A. Edison, was one of the many curiosities placed on exhibition at the eighty-ninth annual meeting of the American Association for the Advancement of Science, held recently at New Orleans. The model consists of a box, a microphone and a call bell, rung by a coil-vibrated clapper.

Science Service 12/23/31

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 a2593 Cincinnati
 WATERPROOF AND STAINLESS
 MATERIAL FOR BUILDERS



© International News Photo
 Torpedo Powered by a Motor and Used by Liquor Smugglers to Carry Contraband under Water

RUM-RUNNING TORPEDO CAUGHT CROSSING DETROIT RIVER

Liquor smugglers operating between Detroit and Canada until recently were employing a submarine conveyor in the form of a torpedo to run the contraband across the Detroit river. This underwater container was powered by a motor and was attached to a cable, a mile long, stretched beneath the water. Twenty cases each half-hour was the capacity of the layout.

New York Herald Tribune
RUBBER MADE FROM CRUDE OIL AND GROUND SUGARCANE

Synthetic rubber is being made from crude oil by a company in Mexico which is employing a process developed by a research chemist who for a long time had held the idea that petroleum in its early stages closely resembled rubber. The formula is intended merely to return the oil to its early stages, and to do this ground sugarcane or any other ingredient with a high sugar content is mixed with the petroleum. The compound is refined and fried in the sun, then vulcanized with sulphur. Automobile tires have already been made from this synthetic rubber and tested successfully, and it has been found it can be used for nearly any purpose to which natural rubber is adapted.

Used by Compañia
Huleira Mexicana
Mexico City

A laminated material with a fiber base, produced in many different colors, designs and wood grains, has recently been presented for inside or outside finishing and decoration. It is used for the same purpose as marble, structural glass, wood paneling or finish plaster coats. It is supplied in sheets easily cut with ordinary carpenters' tools, and for interior decoration can be cemented directly over concrete or plaster. Several different marble finishes are available for exterior or for baseboards, window sills, table tops, kitchen finishes or artistic effects. The material is washable with any type of cleansing material, even paint remover being unable to change its color. It does not absorb water or oil and is unstained by fruit acids. It withstands temperatures as high as 300 degrees and is not seriously injured by such accidents as cigaret burns. Scratches can be sanded down and the color restored by oiling. One of its most beautiful applications is as wall paneling in the various wood grains available, or in jet or variegated marble for use as exterior fronting.

a2439
TEMPERATURE INSIDE AND OUT TOLD ON ONE THERMOMETER

Temperatures indoors and outside can be read at a glance from the same instrument which has two separate scales. At the top is an ordinary column thermometer to record room temperature. Below is a dial which registers the outside reading by means of a tube from a sensitive element outdoors.



The cause of infantile paralysis is an exceedingly minute microbe, roughly only five-hundred-thousandths of an inch in size.

Dr. Frederick
Elson Int. Gen. Hospital
Univ. of Calif. Medical School
San Francisco Calif

a253
perfected by
Julius Valley Laron

Electric Insulating
and Meter Co.

Working in Chicago
1300

511 G. Hamilton St.
St. Louis, Mo.

A 2566 Buhl Aircraft

POPULAR MECHANICS

Corps McClair 45
much

BUSY BRAIN USES
MORE SUGAR
THAN ARM

More sugar is absorbed from the blood stream by a man's busy brain than by his arm or leg. Tests on more than 300 subjects showed Dr. Abraham Myerson that brains of conscious persons absorbed twice as much sugar as when the same people were unconscious. This discovery is expected to aid in the study of mental and nervous disorders. Doctor Myerson tested the blood as it moved into the brain through an artery and again as it left the brain through the jugular vein, before it could mix with blood from the rest of the body. In a large majority of the tests the jugular vein contained less sugar than did the blood vessel entering the brain. In similar tests, it was found that the brain withdraws more sugar per 100 cubic centimeters of blood than does the arm or leg.

COPYING STAMP WITH STENCIL
HAS AUTOMATIC INK FEED

Thousands of copies may be made with a self-inking stamp now on the market without re-inking. No set-up work is required in operating the stamp, which is already inked. A stencil is prepared by typewriting, handwritting or drawing on paper. The stencil is then laid on the face of the stamp, the frame is snapped on and the stamp pressed on paper used for copy work. The ink is fed automatically.



Stencil and Self-Inker Enable This Stamp to Make Thousands of Copies without Re-Inking

The Ideal Stamp Co
297 Fulton St
Brooklyn, N.Y.



Latest Type of Autogiro Has Two-Place Cockpit in Front, and Engine and Rotor behind the Pilot; Frame Is Triangular

AUTOGIRO WITH ENGINE BEHIND
IS PUSHED THROUGH AIR

With engine and "windmill" placed behind the pilot's seat, a two-place autogiro of the pusher type recently was successfully test-flown at St. Clair, Mich. Instead of a closed fuselage, the rear structure of the craft is a triangular open frame, converging at the elevator and rudder surfaces. Placing the driveshaft of the rotor and the framework behind the flyer is expected to give the pilot much better vision.

LIGHTS TO COLOR WATERFALL
FOR DISPLAY AT NIGHT

Colored lights playing on sixteen waterfalls down the side of a seventy-foot hill will welcome night visitors to a park at Jackson, Mich. In the completed project, cascading water will start at the top of the hill, continuing through a series of falls and pools to the bottom. One-color flood light will be directed upon the face of all the falls, while from the bottom changing colored light will creep slowly to the top. Three groups of falls will be headed with pools, enlivened by electric fountains with varying sprays of colored water. A model of the illuminated cascades has been constructed by the General Electric company.

Prado, El Capitan
outdoor beauty place

General Electric Co
Schenectady, N.Y.

Cleveland Plain Dealer 11/13/32

A 2555

A 2545

copy stamp
Paid

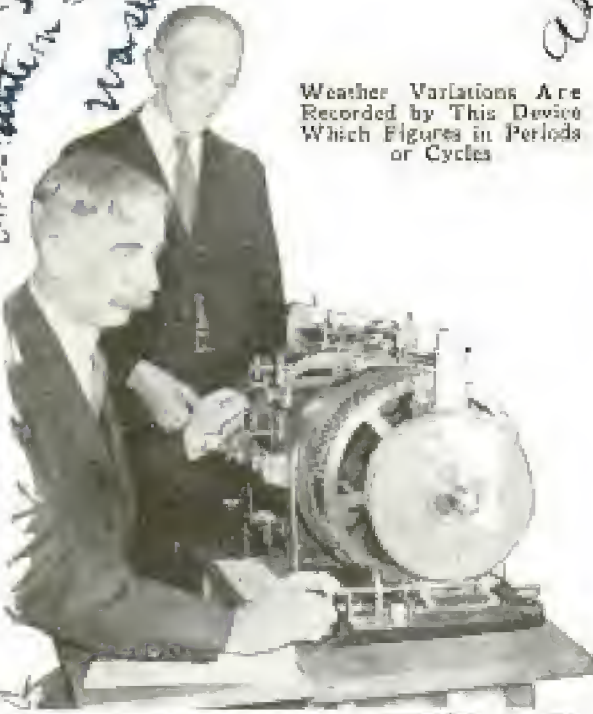
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Science Service

12/10/31

Weather Variations Are Recorded by This Device Which Figures in Periods or Cycles



BRASS BRAIN TELLS WEATHER BY SUN'S CYCLES

Long-distance weather forecasting may be made possible by an instrument which reacts to solar radiation. Constructed in a large part of brass, the device is expected to show whether variations of the sun's heat occur in cycles, periods of rise and decline, at regular intervals. The instrument can be operated by anyone without training in mathematics, and works out periods faster than a mathematician with pencil and paper. Should the machine show that the solar variations occur in cycles, weather experts will be enabled to forecast weather for long periods.

KEY LOCK FOR DIAL TELEPHONE STOPS MISUSE



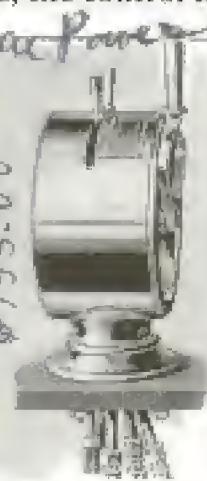
Unauthorized use of dial telephones may be stopped, and toll bills reduced, by a lock now on the market. The lock is a cover which fits over the dial, and when the key is turned, operation of the phone is impossible.

EDISON WORK REVIVED TO END PHONOGRAPH-NEEDLE SCRATCH

The kind of phonograph recording used by Edison in his original work promises to return to practical use and bring about the most faithful reproductions of music. Halsey A. Frederick, of the Bell Telephone Laboratories, has demonstrated new disk records cut by the vertical instead of the lateral method used in ordinary phonographs. The new system of music reproduction is claimed to eliminate needle scratch. The material of the new disk is cellulose acetate, the same substance that is used in making cellophane, rayon and other new products of synthetic chemistry.

THROTTLE RUNS WHOLE BOAT BY ONE-LEVER CONTROL

One small lever controls the entire movement of the gasoline-powered boat or cruiser from full speed ahead to full speed astern, by means of mechanism recently developed that shifts the clutch and reverse gearing by power. The mechanism is composed of two units, the control head installed at the hand of the pilot, and a power assembly installed on or near the engine. Throttle-synchronizing mechanism in the control head is so linked that when the throttle lever is placed in neutral or reverse, the power clutch acts to carry out the operation automatically. The entire mechanism is simple and easily installed, as all heavy rods, hangers, chains, gears, jackshafts and levers are eliminated. Copper tubing is placed between the control head and the power unit, and can be run in any direction and to any necessary distance. The control is furnished in two types, the smaller handling engines up to 200 horsepower and the larger for heavy-duty power units. Finger-tip pressure is sufficient to move the control lever.



▲America's expenditure for education in 1931 was \$3,200,000,000, it is estimated.

Federal Office of Education

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Dr. Charles E. A. Smith
Secretary, Smithsonian Institution
Washington

Protector, Fire Co.
41 Union Square
New York

20. Cornea do, dup.
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1935 Broadway New York

Walton, Crutenden & Co. Middletown Conn.

a 2595 Chance Bros & Co Ltd

POPULAR MECHANICS

417

Glass Is Spun as Fine as Silk to Save Heat



Glass as Fine as Silk Is Good Insulation; Above, Spinning Glass; Below, Pipe Being Wrapped with This Non-Conductor Material

Long threads or fibers of glass, flexible and fine as silk, are now used as heat insulation on pipes, boilers, tanks, turbines, locomotives and marine engines. The fibers are made up loose for internal packing, in sheets and strips for outside wrapping, or in mattress form to be inclosed in wire gauze, netting or asbestos cloth. The glass is unaffected by cold and withstands 900 degrees Fahrenheit without disintegrating.



FEEDING GERMS IS WORLD'S QUEEREST OCCUPATION

One of the world's strangest and most exacting occupations was brought to light in St. Louis recently when motion pictures of living cancer cells were exhibited before the Radiological Society of North America. The cells are being grown in glass tubes, and the feeding of them is the ticklish part. Three research workers from Columbia and Johns Hopkins universities are the scientists who have succeeded in causing the cells to grow. Although, in man, the presence of cancer is sure death unless checked, the cells themselves are extremely delicate. A single invisible bacterium or mold floating through

the air of their glass prison while they are being fed, kills them. They are kept in a specially constructed tunnel, lighted by windows. It is big enough to hold a table, on which the cells live in glass receptacles of various shapes. The caretakers sit outside, thrusting their sterilized hands and faces through special openings. They are dressed in sterilized uniforms, and they cannot even speak while their heads are inside. Even the air is washed before it enters the tunnel. The cells are fed through sterilized glass pipettes on special food, known as plasma. They keep on living indefinitely if fed, and each cell has the power to move from place to place by a sort of swimming motion. Along with the cancer cells, healthy human flesh cells are raised artificially in an effort to learn the differences between the malignant and normal cell. Some of the cancer cells are highly sensitive to radiation from X-rays and radium while others are not. Some also can be killed easily with heat.

Washington, D.C.
Crocker Cancer Research Institute
New York City

similar glass
7 & 4 1/2 inch
new York

And. S. D. Price, 1521 Manager
Houston, Tex, as

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ELECTRICITY

Scientists Predict New Era
of Power Produced Directly
from Light

By W. W. COBLENTZ

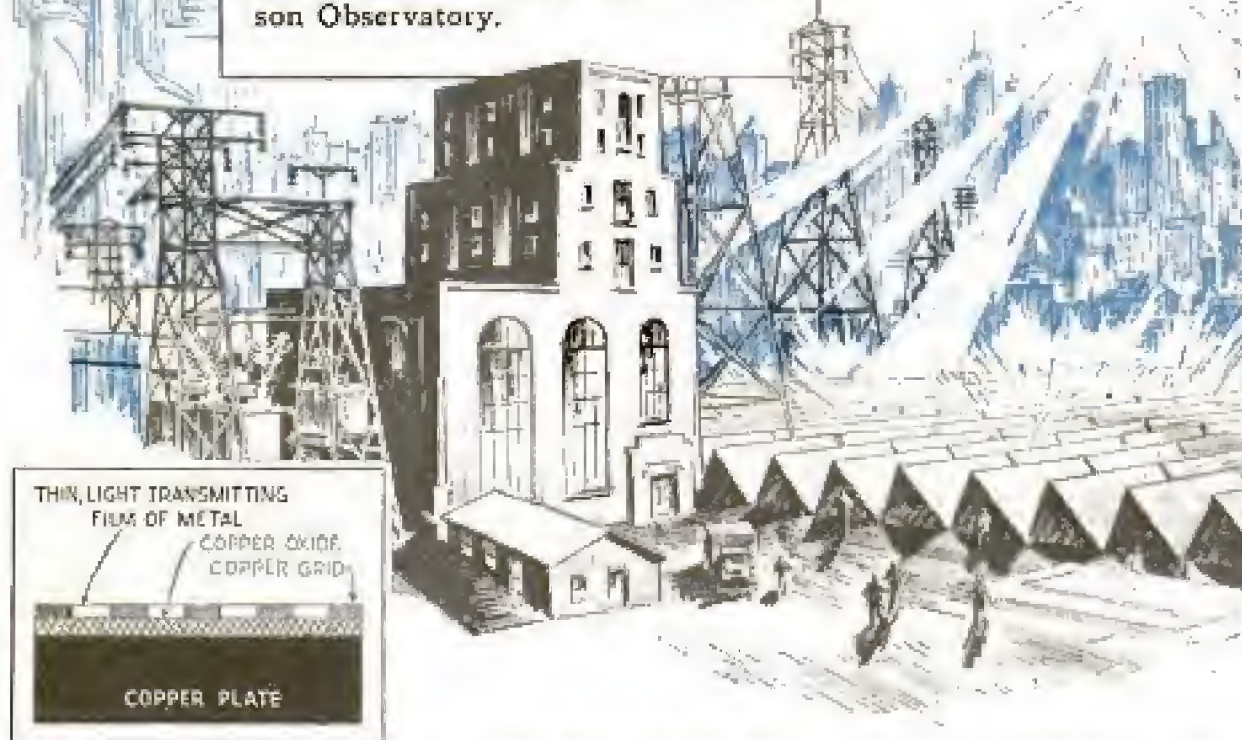
United States Bureau of Standards

Washington, D. C.

The Power of the Future

SOONER or later we shall have to go directly to the sun for our major supply of power. This problem of the direct conversion of sunlight into power will occupy more and more of our attention as time goes on, for eventually it must be solved.—Edison Pettit, Mount Wilson Observatory.

is an old ambition. But not until recent years has the dream come true that light can be transformed directly into electric current. That the phenomenon depends upon the length (frequency) of the light wave, and is not



How Light Cells May Be Utilized to Produce Electric Energy from Sun, Something Already Accomplished Experimentally; Insert Shows Construction of Unit

NOT all the physical forces have been harnessed. We are now subsisting principally on the application of power generated from coal and oil; sources of power stored up for us ages ago.

The generation of power from sunlight

a photochemical or thermoelectrical reaction appears to be established by the experiments on isolated spots of molybdenite, using measured amounts of radiation of different wavelengths.

The few experimental machines for gen-

from the SUN

erating electricity from light are inefficient. Nevertheless, discounting the undue publicity given to this device, the generation of electric current by the direct transformation of light waves contains unknown possibilities as great as those of the radio of thirty years ago.

WILL the wheels of commerce and industry one day be spun by electricity taken from the sun? Is mankind on the threshold of a revolutionary source of electrical power—one that will render obsolete the dynamo, release coal, oil and gas from their bondage of servitude?



Above, Doctor Coblentz Showing How He Transforms Sunlight into Electricity; Left, Model of Solar Furnace Now under Construction

from nature—the transformation of light directly into electric current.”

Doctor Coblentz picks up a mysterious little pasteboard box—the familiar circular pill box of the drug store—from which protrude two tiny wires, like insect antennæ. A peep into the box discloses these two wires soldered to a sliver of whitish mineral—molybdenite. Closer inspection through a microscope reveals a tiny particle, not so large as a pinpoint, of some mineral or substance buried in the sliver. He places the top on the pill box and attaches the wires protruding from its side to an ammeter. Then the apparatus is moved into the sun where the light may penetrate through a pin-pricked aperture in the top of the box directly over the tiny mineral crystal buried in the sliver of molybdenite. The needle of the ammeter jumps. He covers the aperture and the needle subsides. Light falling on the “unknown speck” has gen-

“Yes,” declares Dr. W. W. Coblentz, noted government scientist, who says: “The generation of power from sunlight is an age-old dream of man’s; but not until recent years has he succeeded in wresting the secret of accomplishment

Q. 17



erated a current of electricity. Or as Doctor Coblentz puts it, "Light has—supposedly, for we do not know exactly how—knocked the electrons out of the crystal particle and they flow in a circuit."

Doctor Coblentz has measured the length of the light waves that do the trick. They are in the visible range, a little beyond the infra-red rays. They are not longer than one micron—the thousandth part of one millimeter.

His experiment is, however, after all only an experiment. It remains yet to produce electric current from sunlight on a grand scale—and more cheaply than it is produced today in plants, hydroelectric and otherwise, if mankind would be benefited. If only we knew what that tiny crystal is hidden in the molybdenite. If we could only isolate it, find it elsewhere in greater surface measure, manufacture it or locate its counterpart, what unknown possibilities for the progress of man would be opened up through the transformation of sunlight into electricity!

Let us leave Doctor Coblentz and America now, for a moment, and go to Germany. We are in the great Kaiser Wilhelm institute in Berlin. A young

German scientist, Dr. Bruno Lange, is our host. He has before him an apparatus that looks somewhat like a dressing table mirror from milady's boudoir. From it leads a wire cord attached to a small motor. Doctor Lange sets his "mirror" in the sun. Immediately the motor begins to purr. Light has been transformed into electric current and the current is running a motor. The accomplishment of the age-old dream is realized. The practical transformation of light into electricity has taken place. The output of energy from this one photo cell is sufficient for use without amplification.

Doctor Lange has not used the hidden crystal found in molybdenite. His light-sensitive cell is a sheet of metal covered with a thin layer of silver selenide over which another layer of transparent metal is laid, a very few molecules in thickness. Light passing through this transparent metal



Above, Dr. Charles G. Abbott, Authority on Solar Radiation; Below, Dr. Coblentz and His "Pill Box"

© Haritz & Feing

coat generates a current of electricity between the two layers of the "metallic sandwich." The use of silver selenide as a "filler" for the sandwich results in fifty to 150 times more current from the sandwich than can be got from a copper-oxide filler. The photo cells of Doctor Lange are very sensitive, comparing favorably with the sensitivity of the human eye, being but ten per cent less. They are also peculiarly sensitive to color differences.

Doctor Lange has taken out patents at home on his newly developed photo cell and looks forward to its use in the production of electrical energy from sunlight,

see also July 1937-1/12.

though he believes this will not come hurriedly. First an arrangement of a large number of cells in aggregate must be worked out, but the first hurdle is over.

Practical application of these cells to date consists in transmitting phonograph records and sending signals by them. As a future possibility infra-red telephony over long range looms up. Also automatic control of rollers in steel mills, the red-hot iron giving out sufficient light to work the cells, causing them to automatically change the direction of the rollers.

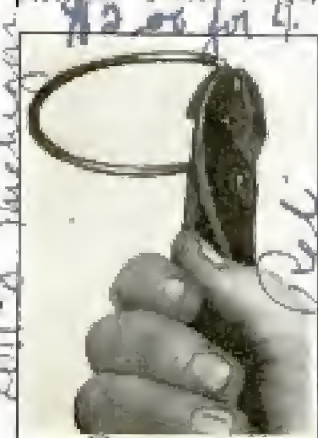
One of the German liners is now equipped with these cells in a new smoke and fire-control system. Air from over the ship is pumped past them through a tube, and smoke in the passing air causes the cells to set off an alarm.

The cost of installing a sun power-generating plant is estimated at about \$25,000 per kilowatt, while the initial cost of present plants ranges from \$100 to \$300 per kilowatt and up. But it must be remembered, points out Doctor Lange, there is practically no second cost to a sun power-generating plant. A 300,000-kilowatt station, he estimates, would require about one square mile of silver-selenide cells.

Here is a promise of enormously more power than mankind shall ever use and from the source of all energy—the sun. Its possibilities are as great as the application of the expansive power of steam to engines, or of wireless.

EXPANSION RINGS FOR PISTONS CHECK NOISES IN MOTOR

Excessive oil consumption, wristpin noise and piston slap can be checked by expansion rings for automobile engine pistons. These rings, now on the market,



are installed by removing the lower crankcase, but without removing the connecting-rod assembly. By pressing the skirt of the piston against the cylinder wall, the ring restores and maintains the original size of the piston.



Electric Eye in Garage Door Which Actuates Opening Mechanism as Car's Lights Fall on It

CAR LIGHTS OPEN GARAGE DOOR DURING NIGHT HOURS

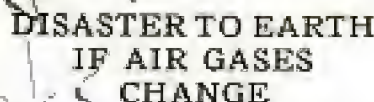
Headlights from approaching automobiles cause the doors of a garage in Albany, N. Y., to swing open automatically as the beams of light fall on them. The secret involves just another application of the photo-electric cell, or "electric eye." In a tiny window in the door, at about the level of the car lights, a General Electric photo-electric tube is placed behind a protective glass covering. The beams of the car lights strike the light-sensitive surface of the electric eye to actuate a relay which operates a door-opening mechanism. Push-button switches operate the doors during daylight hours. When the door has been opened, it stays open until a closing button is pushed, but once closed, it is ready to open again as soon as a car light strikes the window. The installation makes it unnecessary for drivers arriving at night to wait for someone to open the doors for them, or to get out of the car to operate the push buttons.

New York Power and Light Corp.
Service Building, Albany, N.Y.

Chicago S. E. Cronin by 20112
Chicago S. E. Cronin by 20112

Chicago S. E. Cronin by 20112
Chicago S. E. Cronin by 20112

Reliance Specialty Co.
Cable to at
2500 Level
Canada
1 Holyoke, Mass



Two Views of a Miniature-Automobile Factory That Assembles Tiny Cars as They Pass through the Plant on Endless Conveyors

shut out and animal life would become impossible.

LESS "ACID MOUTH" IS FOUND
IN EXCITABLE PERSONS

Acidic saliva, popularly known as "acid mouth," which attacks the tooth enamel, has been found to be less prevalent in persons of excitable temperament, while calmer personalities are more apt to exhibit its presence, according to a research physician at a Chicago juvenile institution. The report suggests that abnormal acid-base factors may affect not only the temperament of the normal person but also the more serious disturbances of mental disease. The evidence, says the report, shows that serious mental deviations almost invariably exhibit signs of acid-base disturbance, and that lowered acidity is associated with the more active states.

Botanical Laboratories,
McGill University
Montreal, Canada

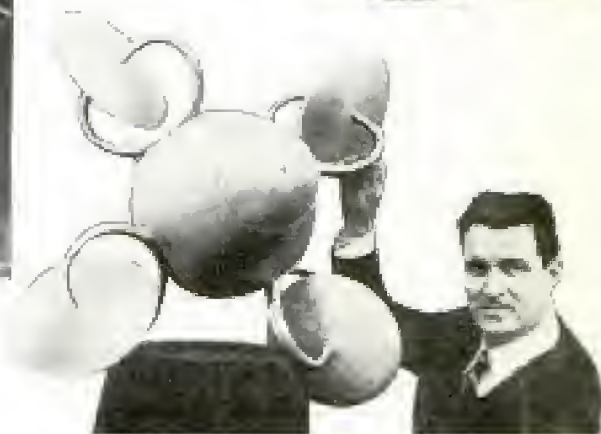
Wm. J. Silber J. Rich
Institute for Juvenile
Research 907 S. Lincoln

Ruggiero Bonghe 19.9 Air Propeller of Disks Has Variable Pitch *Rome, Italy*

Four rotating disks arranged at equal distances around a hub and set at a variable angle to its plane of rotation, make an effective air propeller as designed by Guido Tallei, Italian inventor. The disks are held in place by fork arms and rotate with the friction of the air. The over-all length between the outer peripheries of the disks is considerably less than the standard type



"Diri-Disk" as It Appears in the Air, Top; Working Model of Craft, Above, and Disk Propeller, Right



of fixed-pitch propeller. Sig. Tallei has fixed his new propellers to his latest model of the "Rotating Diri-Disk," an amphibian dirigible-gyropter-airplane which he introduced a year or so ago. In addition to the propellers, the latest design of the diri-disk has a fixed elevator projecting above and slightly in front of the round "wing." The diri-disk makes use of a disk-shaped gas bag, turned by airplane engines, which acts as wing surface besides supplying lifting power as a result of its gas content.

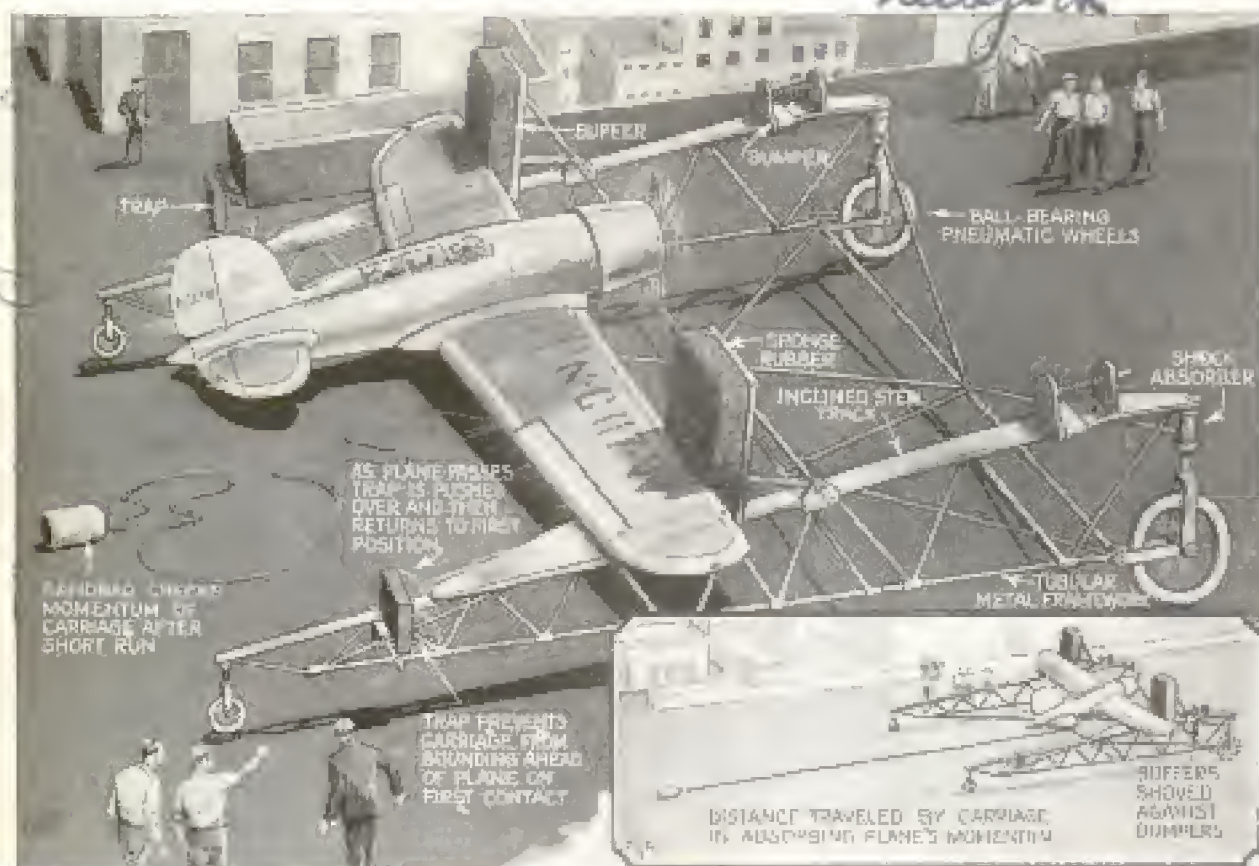
TERNS SHOW "HOMING ABILITY" SUPERIOR TO PIGEONS *Well*

Terns or sea swallows have the ability to fly back home from greater distances than the most carefully trained homing pigeon. Experiments by Dr. John B. Watson, working with the Carnegie Institution's ~~marine~~ biological laboratory, show

that the tern, without training, can reach home from distances of at least 1,000 miles, even though the territory over which it flies is completely barren of guiding marks. One bird, released at Cape Hatteras, flew to its nest at Bird Key in the Tortugas islands in the Gulf of Mexico; 1,081 miles by alongshore route. In comparison, the world's record for homing pigeons is 1,010 miles, covered by a bird selected and trained for the purpose. Terns make their way back to nesting grounds in spite of darkness, storm and unknown seas, Doctor Watson found. Not only are they adept at homing, but they never fail to identify their own eggs and chicks, a seemingly impossible task on Bird Key, which is covered with thousands and thousands of similar-looking eggs, as great numbers of the birds gather there for the nesting season.

Washington, D.C.

Sarena Service 1/6/32



Planes Which Have Dropped Their Landing Gear Can Come to Earth Safely on a "Cradle"; Roof Landings Are Possible, Since the Cradle Stops Any-Size Aircraft after a Short Run

Herndon and Pangborn, first to cross the Pacific ocean in a non-stop flight, gained seventeen miles per hour and added many miles to their cruising range by dropping their landing gear soon after taking off from Japan. But on landing in the state of Washington, the flyers almost lost their lives. To safeguard airplanes minus the proper landing gear, William S. Glennon, a former naval officer, has introduced an airplane "cradle" which exactly reverses the work done by the catapult used on aircraft carriers. Whereas a catapult is a means of accelerating airplane speed, Glennon's cradle can be used on a ship deck, skyscraper roof or landing field to decrease the speed of a wheel-less airplane quickly and gently, so that the passengers may reach earth safely. The cradle can receive planes with or without landing gears. Its general dimensions are twenty by forty feet. It can easily be built to accommodate ships with a large wing spread. The inventor anticipates that all long-distance flyers will hereafter discard

their rolling gear before starting off on a long flight. In civil or military flying, the addition of seventeen to twenty-five miles per hour is a factor worth consideration.

Q 2491
**LIGHT SUSPENDED FROM NECK
 LEAVES HANDS FREE**



Strapped to the body and leaving both the wearer's hands free, a light operating from a six-volt battery now is available. It is especially useful to sportsmen and to those who find it necessary to work outdoors at night.

The light is suspended from a strap around the neck and held firmly against the body by another strap that is fastened around the waist.

Spalding Bros
211 S. State
Chicago

University Club; 4 W. 54th St. New York

Geo. M. Mantor
ex. Chief, Seattle Wash.
POPULAR MECHANICS

B-49

**DUST THAT SMOTHERS FLAMES
ENDS WATER DAMAGE**

Dust that extinguishes fire instead of starting or encouraging it was demonstrated recently before Portland, Ore., fire officials. The dust is sprinkled in the vicinity of any fire hazard, and, upon being heated, releases carbon-dioxide gas which smothers the flame. It is a substitute for water or other liquids which might damage property with which they come in contact. The dust can be swept up after it dries and be used over again, according to its inventor.



Enlarged Sample of the Work Done on Machine That Types Hebrew or Latin Characters

**ENGLISH AND HEBREW WRITTEN
ON SAME TYPEWRITER**

Reversing the Hebrew letters to read from left to right, instead of in the age-old manner from right to left, a St. Louis educator and attorney has invented a typewriter that writes Hebrew and English, linearly or interlinearly, simultaneously or interchangeably. It is the first of its kind ever to work successfully, it is said.

**HOW CLEAR IS LAKE WATER
TOLD BY "SUN MACHINE"**

Experiments in the productivity of certain lakes have led to the development of a curious instrument which will show the transparency of the water. Many natural bodies of water have been shown to be as clear and free of chemicals as though the water had been distilled. The apparatus is known familiarly to the investigators as a "sun machine" and consists of a revolving disk containing colored glasses corresponding to the colors of the spectrum. The device is sunk to the depth desired and readings taken on electrical instruments in a boat on the surface. From the amount of energy registered on the surface instrument the amount of transparency is obtained, and from this, the quantity of vegetation, supplying the food of animals, in the water.

Here West Alphonse
2920-1st Ave
Seattle, Wash.
4639 Montgomery Ave
4639 Montgomery Ave
4639 Montgomery Ave

**"IRON MAN" TAMES BAD HORSES
FOR CAVALRY SMITH**

Various western remount stations of the United States cavalry have adopted an ingenious "iron man" to tame horses. Lives of the army blacksmiths long have been menaced by vicious steeds brought in to be shod, so now stock now is placed in a rugged wooden frame and haltered there. A sling operated with a winch and rope cable then lifts the horse until his toes barely touch the floor, in which position the outlaw is practically helpless and much of the fight already taken out of him. A metal clamp attached to a pipe arm is then fastened around the fetlock of the hoof to be shod, and by means of gears controlling the movement of the arm, the foot is raised to the position desired. It needs but a few tussles with the iron man to tame the wildest broncho.



Courtesy U. S. Forest Service
The Iron Man That Speedily Convinces the Wildest Outlaw Horse That His Struggles Are in Vain

Used at Army Remount
Station

Mr. David Langah
111 1/2 1st Ave
no street address

Q 2556
Capt. Allen P. Child,
Box 4673, Kansas Mo
City.

University of Wisconsin
Madison, Wis.

B. 25 National Theatre Science Service 10/22
 426 Suppl. G. POPULAR MECHANICS
 92. Could it be used



Complete Portable Sound-Film Projector Designed for Use in Schools as Teaching Aid

PORTABLE TALKIES FOR SCHOOL SPEED UP EDUCATION

Projection of sound pictures for school and other non-professional purposes is achieved with portable equipment said to be the first ever developed for the purpose. Sound film is used in the projector and the entire equipment is complete, including loud speaker. In a test of visual education, a group of ninety-seven school children were first given a written and oral test of subjects previously studied. They then were shown sound pictures of the same subjects, and the final test showed an average gain of thirty-eight per cent in knowledge. The equipment is not offered as a substitute for the ordinary methods of teaching children, but as a very effective supplementary. The projection and sound apparatus is designed to give results equal to those obtained with the finest theater equipment. While designed primarily for educational purposes, the equipment is equally adaptable for use in hospitals, churches, community centers, industries and on ship board.

SPEED OF SNAKES IS DELUSION PRODUCED BY FRIGHT

Snakes do not travel at lightning speed, despite popular opinion about their rate of locomotion. This is the conclusion of Dr. Walter Mesner, zoologist at the University of California, who found that

under repeated tests the famed blue racer never exceeded a maximum of two and one-half miles an hour, hardly as fast as a person walks. Reports of racing speed, the zoologist believes, are usually the result of mental delusions produced by fright, both of the observer and the snake, and by the winding motion of the reptile. To find just exactly how a snake propels itself, there was research with an X-ray camera, scalpel and stop watch. Devoid of legs, fins or other reasonable propeller mechanism, the snake makes up for the deficiency with an elaborate muscular layout. In general its backbone is connected with its ribs by a host of strap muscles, each attached to at least one vertebra and one rib. Sometimes a rib is connected to a joint sixteen ribs away, sometimes to one near by. These connections permit any kind of wiggle or bend. Nothing is connected at right angles, all forces acting obliquely, and as a result the snake never gets on "dead center." The "side-winder" rattlesnake apparently slides side-wise in two parallel tracks, corresponding in this performance to a two-loop spiral modified by muscular displacement.

LABEL ON HOOD OF CAR SHOWS THE SIDE FOR OILING

Filling-station attendants know at a glance which side of the hood is to be lifted for oil inspection if the car is equipped with decorative gilt labels conveying this information. The signs are on paper that, when wet, transfers them to the side of the hood. On one panel the sign reads "Oil on the Other Side," while the opposite label reads "Oil on This Side."



Gilded Label for Hood of Car, Which Shows Filling-Station Man the Side to Lift in Checking Oil

Los Angeles, Calif

Dr. E. J. Freund
 Valparaiso material

B. 16 Capt. Lawrence & Andrews

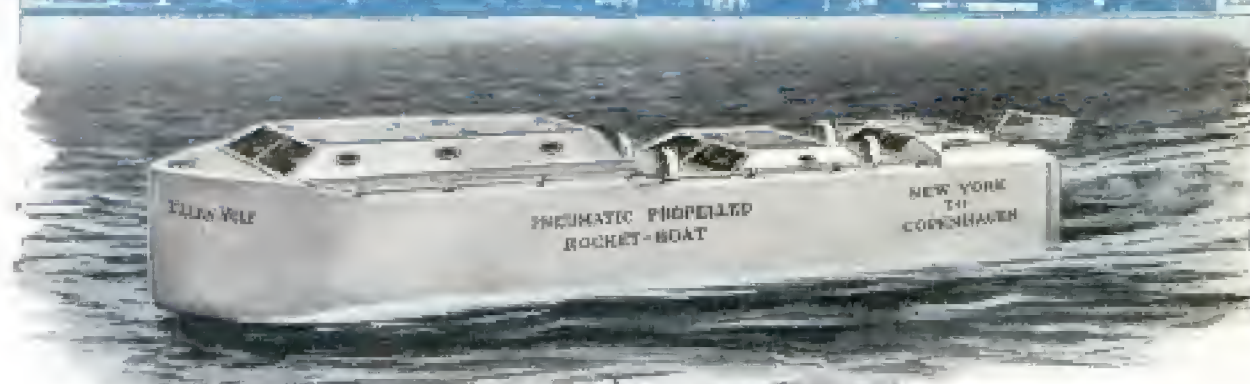
113 Lafayette Ave

Hempstead L.I.

Across Atlantic in Seventeen Hours?

AIR ROTOR SPEED CRAFT

To Seek Record



© Brown Bros.

SOLO transatlantic flights to establish new time records from the United States to England will not be confined to aviation this spring. Passengers on oceanic liners need not be surprised if they find the steamer lanes usurped by a twenty-foot silver-streak, skimming the surface at more than 100 miles per hour.

Dr. Christian A. Voh, New York inventor, has planned just such a trip to visit his native home in Copenhagen. He will make it in his own revolutionary type of boat, the "Ellen Voh," the first air-driven ship.

In fact, the inventor expects to arrive in England seventeen hours after leaving the United States, departing at two o'clock in the morning and arriving that same night in England.

Tests with the "Aditi" indicated that, while the fastest speed boats in the country now require about 2,000 horsepower to gain a speed of 100 miles per hour, the rotor-propelled ships will require but little over 100 horsepower.

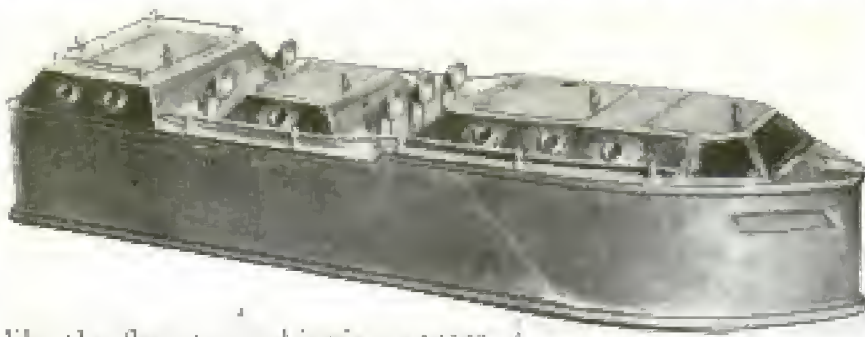
As the name implies, the basic part of the new craft is the rotor. Air is taken in through deck ventilators aft, the openings of which face the direction of the boat. Then it is piped to the forward part, drawn down by two high-speed rotors and expelled through an exhaust pipe beneath them.



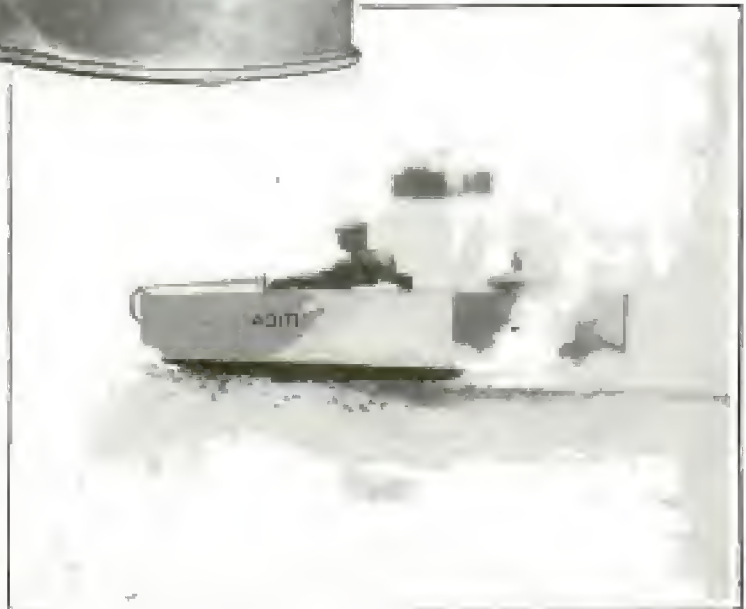
Above, the Rotor Ship in a Trial Spin down East River;
Below, a View of the Rotors

The rushing air strikes the water with a tremendous force and the boat moves forward. All motion created tends to accelerate movement. This is unlike the conventional type of propeller-driven boat, in which efficiency is lost when the propeller whirls too fast or when the blades create a hole at the stern, causing it to settle and adding to the resistance of water slapping at the prow.

In the rotor boat, the prow is built in bulbous shape, like that of the whale. Movement sets up only one resistance, that of the original contact of prow with the water. There is no other surface offering resistance to motion. It rides an even keel regardless of speed. In effect, it is



Left, a Model of the New Complete Twenty-Foot Rotor Ship; Below, the First Rotor Speed Boat, "Aditi," as It Appeared in Action



Photos © Brown Bros.

like the flat stone skipping across the water, although the boat does not leave the surface.

"Present efficiency of speed boats from the standpoint of horsepower consumption," says Doctor Volf, "is hardly more than eight per cent. The more speedy they are, the less efficient do they become. In all boating, it is safe to say the average is eighty per cent deficiency in use of energy. What constitutes any other boat's deficiency becomes my efficiency. My boat utilizes more than eighty per cent of the energy.

"In developing the boat rotor, I decided to use air as the force instead of hydraulic force, because water finds its own equilibrium too soon. Use of air eliminated vibration for it had 'give,' its compression taking up the shock. Water striking water would create vibration as it cannot compress. It would leave no force beyond the momentum.

"Speed of the conventional boat is retarded forty per cent because it sinks at the stern, rising at the prow in proportion to its length. Water slapping at the raised prow at top speed adds twenty per cent further retardation. Thus the efficiency of the speed boat is far less than the steamer, for the steamer rides a level keel."

The first of the rotor ships, the "Aditi," had its trials on the Hackensack river, New Jersey. These tests established the practicability of pneumatic-propelled craft. The boat, fourteen feet long and utilizing but one of its six horsepower of energy, moved its ton of weight at one mile per hour.

The keel construction is as revolutionary as the power plant and hull design. There is a tri-sectional keel. One triangular keel is in the center and one each on starboard and port side. The air ex-

hausts are forward, between the keels.

In the ordinary boat, a wave, as it passes, off-balances the gravitation center, causing a rolling motion. In the Volf boat, the wave strikes the side and is tossed back by the outside keel, keeping the boat balanced.

The new twenty-foot craft is all enclosed and is made entirely of duraluminum. While it is much larger than the first boat, it does not weigh as much.

LONG-RANGE WEATHER IS TOLD 25 1/2 BY ABNORMALITIES

Weather predictions good for a month are being made possible by the fact that abnormal weather in mid-winter or mid-summer often persists over periods of sixty days or more. Forecasts based on this discovery are correct over eighty per cent of the time, in certain cases, Charles D. Reed, of the Des Moines weather bureau, has found. A hot June, for instance, will be followed by a dry July nearly 100 per cent of the time in the Mississippi valley, and a cold January indicates an eighty-per-cent chance that February also will have temperatures below normal.

Des Moines, Iowa

INDIANS THAT MET COLUMBUS
OBJECTS OF RESEARCH *15

What tribe of Indians welcomed Columbus to San Salvador has never been known to scientists, but a one-man expedition from the U. S. National museum has set out to identify them, if possible. Herbert W. Krieger will seek remains of the tribe by digging at the location where the discoverer of America first set foot. The common belief is that the tribe which met the explorer was of North American origin, but Mr. Krieger believes it quite possible they were South American, the Arawaks. In previous West Indian explorations he has found all Indian cultures to be South American. The islands nearest Florida remain in doubt, however. Although Columbus left letters and diaries describing the natives he encountered, none of his accounts is sufficiently complete from the ethnologist's view to give a definite clue. Such details as he did give, however, point to the Arawaks, Mr. Krieger believes. The tribe was friendly, and had it been a band of Caribs, there would have been a different story to tell. The fact that they ate cassava bread instead of bread made of maize further bears out his theory of their South American origin.

THREE-WHEELED AUTO SPEEDS EIGHTY-FIVE MILES AN HOUR

Speeds above eighty-five miles an hour are claimed for a small three-wheeled automobile developed by a Long Island engineer. Built of duraluminum, the car has its thirty-four-horsepower motor in the rear. In trial spins, the inventor has attained an eighty-five-mile pace.



Powered with a Small Engine in the Rear, This Three-Wheeled Auto Attains High Speed

Wheeled Auto Attains High Speed
 dno. James Martin
 Garden City, L. I.
 New York

Field Glasses Pinned
to Headgear Leave
Sports Announcer's
Hands Free



"EYES" FOR SPORT BROADCASTS FASTENED TO HELMET

Following the ball is easy for the radio announcer assigned to football, baseball or other games if he wears a new headgear fitted with field glasses. This leaves his hands free for operating his radio.

FOUR MINERALS NEW TO MAN
ARE DISCOVERED IN U. S. 62

Four minerals hitherto unknown to man have been discovered in the United States. The most important, according to the department of geology of the Smithsonian Institution, is a radioactive substance whose largest constituent is uranium, from which radium is derived. This was found in rocks near Spruce Pine, N. C. The new material, called "Clarkeite," is dark brown to orange brown in color and has a slightly waxy luster. A nearly transparent substance, found in close conjunction with uranium-bearing rocks, but itself not radioactive, is the second new mineral. It is apparently insoluble in water and its principal constituents are vanadium, iron and water. This mineral, named "ferivanite," was found in southwestern Colorado and southeastern Utah. The third substance, named "schairerite," is described as a sulfate and fluoride of soda, soluble and occurring only in the form of crystals. It is a brittle mineral, found in the Searles lake region of California. "Krausite," the fourth new mineral, consists of iron, potassium and sulphur. It is found in several forms,

17. It is found in several forms.
Discovered by Clarence S
Rosa, Geological Survey.

MAKING HOME



Powder Atomizer That Speeds the Process of Applying Makeup; Inside the Tassel Is a Bulb Forcing the Powder Out When the Bulb Is Pressed

Ball-Bearing and Rotating Swivel Plug Which Can Be Attached to Cord of Any Electric Appliance and Will Prevent Kinking



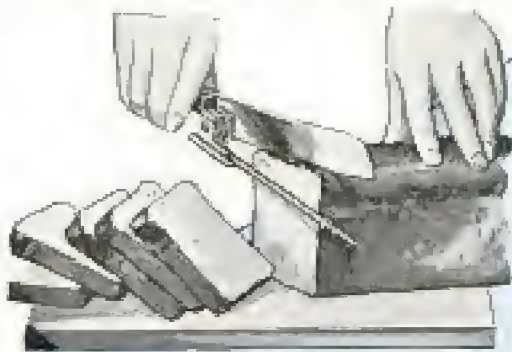
Right. Handy Darning Form Which Fits the Foot of a Stocking. Making Easier the Task of Mending



Above, Cabinet Gas Range with Side Compartments That Offer Storing Space for the Largest Pots and Pans; Right, Egg Holder for the Refrigerator; It Is Placed against One of Side Walls



TASKS A PLEASURE



Adjustable Guide That Fits on Bread Knife to Insure Even Slicing; the Attachment Can Also Be Used in Cutting Cabbage or Other Vegetables



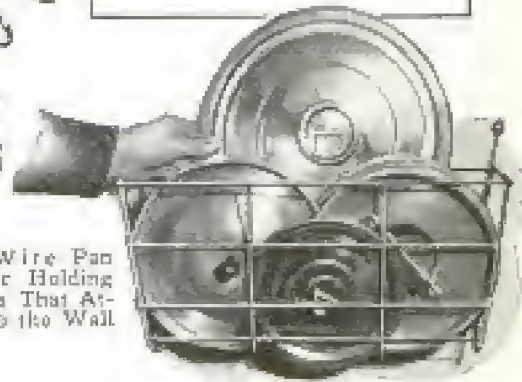
Electric Light and Mirror on Adjustable Stand; It Is Particularly Useful for Makeup and Shaving; the Quilt Also Comes on a Bracket for Bathroom Use



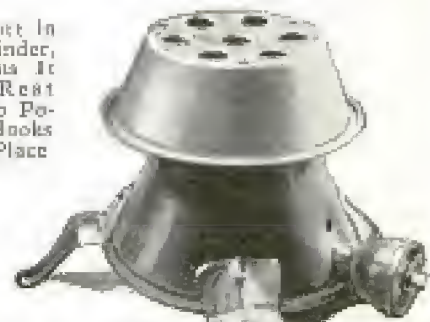
Right, Cut-Flower Holder for Dish or Bowl That Permits Graceful Arrangement as Above



Right, Wire Pan Rack for Holding Pot Lids That Attaches to the Wall



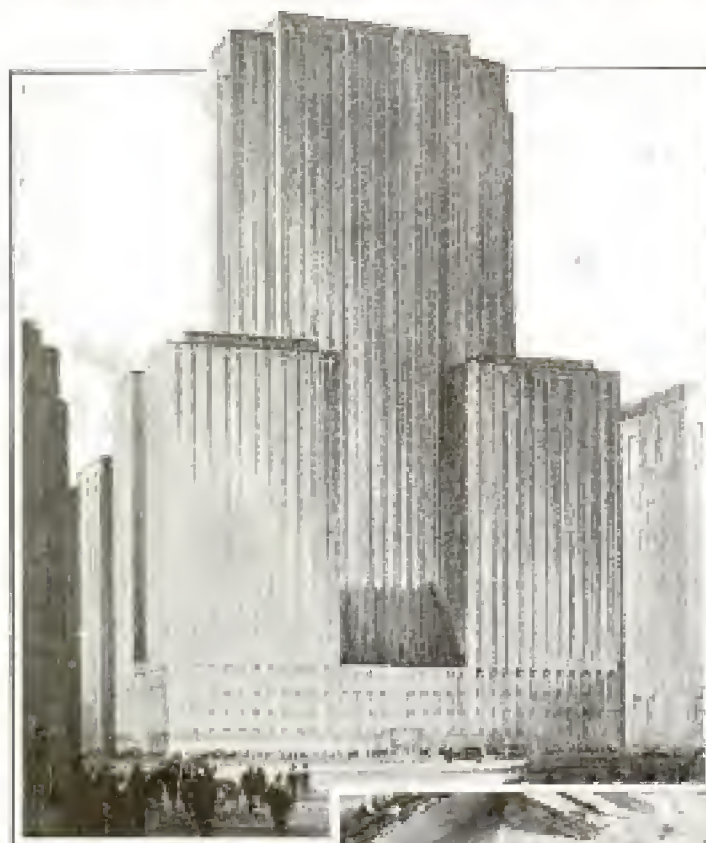
Collapsible Support in a Loose-Leaf Binder, Which Transforms It into a Book Rest When Raised into Position; Binder Hooks Hold Book in Place



Gas Stove, with Cylinder Flue and Plate, Which Saves Fuel

a 24 + 9
432

Bamboo Hut the Model for First Skyscraper



Top, Office Building to Occupy Site of First Skyscraper; Center, Column of First True Skyscraper, and, Below, a View of the Building, Recently Torn Down

The Home Insurance building, a twelve-story structure in Chicago, recently razed to make way for a forty-two story office building, constituted America's first true skyscraper, a committee of architects has decided. In reaching their decision, the architects were forced to define a skyscraper, and they finally agreed that it embodies the principles of skeleton construction in which "a metal frame or cage, composed of girders, beams and columns, supports all internal and external loads and carries all stresses directly to the foundations." The Home Insurance building, erected in 1885, was the first structure in which these principles were fulfilled, for its steel framework support-

ed all the rest of the building. The architect, the late William LeBaron Jenney, got the idea for its construction during a visit to the Philippine islands. He observed that the natives built their huts by making a skeleton of bamboo trees, then introduced a curtain-wall effect by weaving smaller members and leaves with the skeleton sides. Returning to this country, he incorporated the idea of iron columns instead of bamboo in some of the smaller structures he built, then boldly proposed to build a steel frame "towering" ten stories high, and hang the walls on it. There were claims that contraction and expansion of the metal would cause the walls to bulge and the roof to rise, but Jenney went ahead and proved his idea was sound. When

the building was torn down, it was found that the interior of the cast-iron columns had been filled with concrete. Records showed cautious city officials re-



by H. B. Quinn, Jr. Q 487

quired the concrete as extra fire protection, much to the chagrin of the salvage man who had purchased the columns on a pound basis, not knowing they were filled with concrete.

**GRAVEL WALL IN YOUR WELL
RAISES ITS CAPACITY**

Capacity of a well drilled in sandy strata can be increased by placing a gravel wall at the bottom of the well casing, according to a report before the American Waterworks association. In one case cited, ten wells had been scattered over as many acres in an attempt to obtain an adequate city water supply, all of them producing a total of only 1,200 gallons a minute. With the adoption of gravel walls, one well alone gave twice as much water as all ten had been able to do. By feeding the proper type of rough gravel into the space between the inner and outer well casings, a circular wall will be built up around the metal screen, necessary in sandy soils, about three times the diameter of the screen tube. The wall actually becomes a screen itself and stops the fine sand from clogging the screen grating.

**LEVEL FOR LINES OR SURFACES
IS TWO TOOLS IN ONE**

Two tools are combined in a level that checks either lines or surfaces satisfactorily. The instrument weighs only a half ounce, is three and a half inches long and is made of aluminum tubing, hexagonal in shape. Special hooks are placed on the two ends to prevent the level from falling off the line. The fluid is quick-acting and of a contrasting color, making it easy to see. The instrument is designed particularly for all types of carpentry layout work, including lawn grading, is useful in the home for leveling clocks and stoves.



Level That Measures Lines or Surfaces and Is So Built It Cannot Fall Off

in window trimming, sign painting and bricklaying, or for laying out golf courses.



Dialing the Number of a Stock Will Bring Latest Prices on Private Office Registers Now in Use

**DIAL BRINGS STOCK MARKET
FIGURES TO OFFICE**

Stock-market quotations may be received in one's private office direct from the exchange by means of a device called the "teleregister." To get quotations on a certain stock, a dial signal is put through to the exchange and the figures are flashed on a receiver in the broker's office.

**WAY TO TEST WELDED JOINTS
IN BUILDING IS SOUGHT**

While a few buildings with welded instead of riveted joints have been constructed, some instrument for testing or inspecting the welded parts on the job must be found if the noisy pneumatic riveter is to be replaced. A building with a thousand welds may have just one defective joint—enough to cause a collapse if great strain and weight were to fall on that joint. The possibility of rapid X-ray inspection of the internal soundness of a weld has been held out by experimenters, but nothing definite has been developed. In recent tests, it was found that good welded joints are better than riveted joints. A riveted joint is no stronger than the steel members to be united, for the riveted metal invariably breaks at the joint. But in a weld the point of union may be made stronger than the plate itself.

Prof. Roy C. Brumfield.
Cooper, New York

Science Service 12/15/31

Q 251

Q 2469

Q 2504

Sand's Level & Tool Co.
8631 Stratton Ave.
Detroit, Mich.

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Q2023

Carl Sam Brown,
157 Carlisle St.
Marion Ohio

MAGIC for



and the ends of this second cord are held by a spectator while the performer retires behind a screen or ducks around a doorway. You count ten, and out bobs our hero again. The knots are still intact, but the performer's vest is turned inside out. Ten seconds behind the screen again, and the vest resumes its normal position.

Behind the screen, you simply push the loop formed by the second cord up over your wrist, as shown in Figs. 6 and 7, so that it can be pulled free. Then you unbutton your vest, and, reaching over your head, you grip the vest at the back of the neck and pull it forward, as in Fig. 8. This will bring it to the front with the cord

HERE we are—three different-ly colored pencils, identical except that one is black, one blue, and the third orange. They go behind the performer's back after being examined by the audience, and he divines each color before bringing the pencil forward.

There really isn't a whole lot of mystery. The eraser tips had been removed and the inside edge of the rubber notched with a pocketknife. One notch indicated the orange pencil; two notches labeled the blue one, and the black was left plain. It was then a simple matter for the performer to secretly pull out the erasers behind his back, feel the markings, put the eraser back, and then make the divination. Smooth working is insured by filing down the small tabs that hold the eraser in place.

Here's another: The performer's wrists are tied with a length of cord, leaving the hands securely tied but some distance apart, as shown in Fig. 4. The knots may be sealed with wax. A second cord is looped over the piece between the wrists,



Above, Naming the Color of Hidden Pencils by Notches Cut in the Eraser Tips; Below, How to Turn Your Vest Inside Out with the Hands Securely Tied

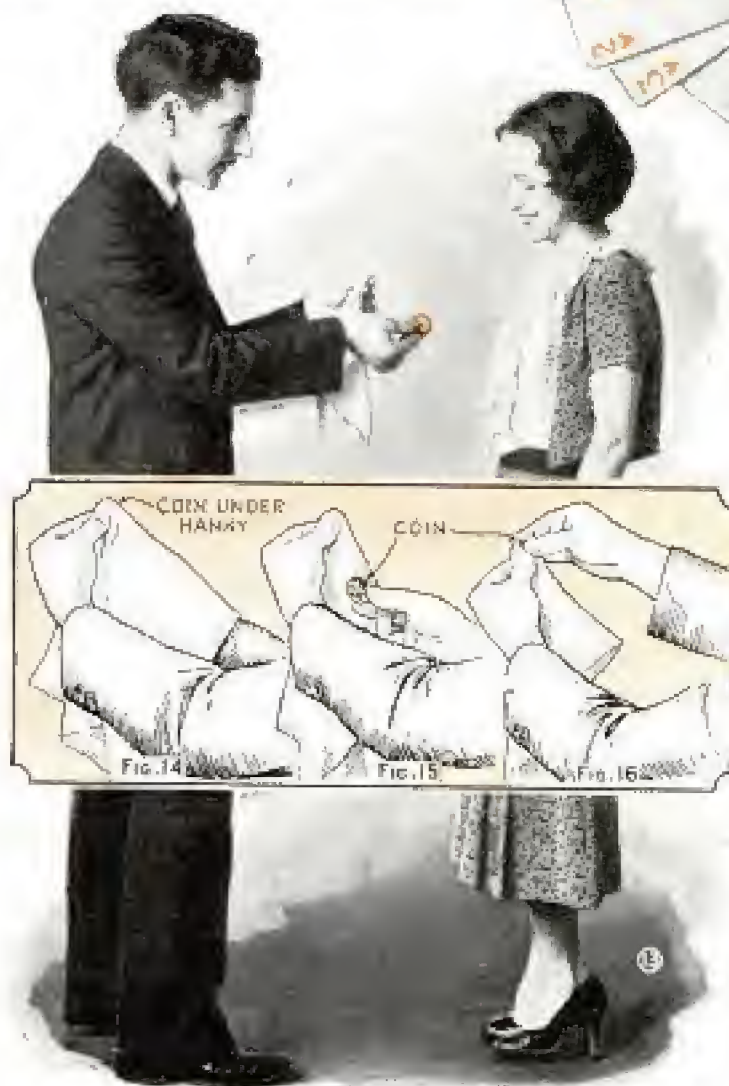
EVERYBODY

passing through the armholes. Nothing more to do, then, but to turn the vest inside out, as in Fig. 9, put it on, button it and slip the spectator's cord back in position. The return to normal, of course, is simply a reversal of this procedure.

If you like card tricks, try this. The spectator selects a card. He returns it to the deck. The performer immediately hands him the deck with the request that he cut it several times and then deal the cards out on the table, face up, in either two, three or four piles. The performer turns his back; he does not know how many piles the cards are being dealt in. The deal being completed, the spectator is told to pick up



Above, Card-Location Trick That Is Quite Boring; Left, Making a Coin "Pass" through a Folded Handkerchief



the one packet containing his card and to discard all the others. This packet is cut once or twice. The performer then deals the cards face up on the table. Suddenly he stops and declares that the card he is holding is the selected one—and it is.

The whole thing practically works itself. You need do but two things: First, when the selected card is returned to the deck, casually break the pack so that it will be returned under the eleventh card, as shown in Fig. 12, that is, the selected card will be the twelfth card from the top of the deck. This small number of cards can be easily counted as you fan the deck for a selection. Second, before handing the deck to the spectator, casually note the bottom card and remember it. You can easily tell from the size of the packet handed you whether



Cigaretts Can Be Made to "Pass" from the Pocket of One Person to That of Another if the Pack Is Prepared Beforehand as Shown

the deck was dealt in two, three or four piles. The chosen card will always follow the key card by three, four or six cards. The performer merely divides the number of piles dealt into twelve and he has the number. Thus, if the pack was dealt in two piles, the chosen card will be the sixth card after the key card. If three piles, the chosen card would be the fourth card after the key card, and so on. The key card will always fall in the same pile as the chosen card, and, holding the packet, back up, and dealing the cards face down, the key card will fall first, after which the chosen card will follow third, fourth or sixth depending on the original deal.

For something simple, try the little solid-through-solid effect shown in Fig. 13. You apparently wrap a fifty-cent piece in a handkerchief and then pull it right through the cloth. Fig. 14 shows the start of the deception. The coin is held in the right hand. The left hand takes the handkerchief and drapes it fairly over the coin. The left hand grips the coin through the cloth. The right hand is then brought from under the cloth in a perfectly natural manner to join the left hand in holding the coin from the outside. But instead of bringing the right hand forth empty, the performer takes the fifty-cent piece along, the deception being screened by the cloth and the impression of a coin in the handkerchief. The right hand then twists the coin in the folds of the cloth, and, after a suitable "penetrating" period, the fifty-

cent piece is magically pulled out. How is this? A brand-new pack of cigarettes is opened by the performer. He spills the contents of the pack into his hand. A spectator is asked to take a handful and put them in his pocket. The performer counts the cigarettes remaining. If there are ten left, the spectator



Fig. 18

must have the other ten in his pocket.

The performer then slips his handful of cigarettes into his own pocket. A second's pause, and then the wizard commands two cigarettes to jump from the spectator's pocket to his own. Counting proves it, the performer having twelve cigarettes while the spectator has but eight. Of course, no one is supposed to know that the performer has previously slit open the bottom of the pack and extracted two cigarettes.

Here is a very simple formula for magic squares. These squares are arrangements of figures which can be added along any row or diagonally to equal the same total. For example, the one shown in the photo, Fig. 19, totals ninety-nine in every direction. You can easily make a magic square from any number from fifteen to one thousand in a moment. Suppose someone calls out ninety-nine. Subtract nine from this, leaving ninety. Divide this by three, giving you thirty. Then, subtract one. Twenty-nine. Starting with this number and stepping as indicated from 29 to 30, 31, 32, etc., you would fill in the nine squares in the order shown. That's all there is to it. Some numbers will give you a fractional result, but this is simply carried forward in regular rotation.

Try this card location. The performer hands the deck to a spectator. The latter is requested to deal the cards into four



heaps face down. The performer turns his back while this is done. Now, the spectator is asked to remove a card from within any pile. He is to remember this card. He is to place it on top any of the piles and assemble the four piles in any order. The performer quickly deals the deck onto the table, one card at a time, and accurately stops at the chosen card.

The trick is based on the fact that many decks have reverse backs, that is, the design is unbalanced so that the card either faces one way or the other. At the start of the trick, the cards are all facing one way. To show the spectator how the

cards are to be dealt, the performer deals out eight cards in regular order to make four piles of two cards each. Two of these piles, four cards, are then picked up and placed on top of the deck, which has, meanwhile, been turned end for end by simply transferring it from one hand to the other. The other two piles are swept together and the pack is dropped over them. Thus, in a seemingly fair manner, you have reversed four cards at the bottom of the deck and four at the top. Now, going through the card selection as outlined above, the deck will return to you with eight reversed cards, assembled in pairs. Dealing out the deck, you pay no

London Series
London
England

attention to two reversed cards which immediately follow each other, but when you come to the one pair of reversed cards which house an odd card between them, as shown in Fig. 21, you can consider the trick over. For that is the selected card.

BOX OF BLOCKS "SPOTS" CARS IN BIG RAIL TERMINAL

To solve the problem of "spotting" express cars so they can easily be pulled in order onto the main line without tying up



Block Board That Enables Terminal Manager to Switch Cars and Make Up Trains in Advance

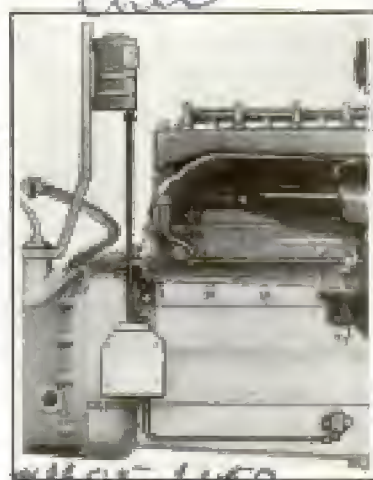
yard traffic, a terminal manager in New York has designed a box with blocks sliding in grooves representing the track layout. Since cars are assigned to certain positions daily and changes have to be made on short notice, the problem of keeping track of them is exceedingly difficult. They must be placed so they can be pulled in the order of train-departing time. Each block, representing one car, is marked with city destination, train number and time of departure. These can be placed in the grooves in any desired order. Each car also has a diagram for loading so that shipments are placed in position to simplify unloading as the train stops at stations along the line. Trains thus are made up one day in advance on the block board and closely followed when the empty express cars are backed in to the terminal by road engines. Much switching is eliminated.

CAMERA TAKES THREE COLORS ALL IN ONE "SHOT"

As the result of the development of a new color camera that can take all three primary colors in the same exposure, news photographs printed in natural colors on a reel-fed rotary press are appearing in the weekly edition of a London publication. The camera operates much like the ordinary news camera, except that it takes prints in yellow, red and blue on three plates all at the same time. A single print in the natural colors of the original is obtained, from which the process worker is able to obtain much better results than if he were working from three color positives. The print paper is passed through successive cylinders, the finished impression being in full color. By this method, what has long been called the "three-color process" has been adapted to the photo-gravure method with the added advantage of rapid printing on rotary presses.

CRANKCASE IS KEPT FILLED BY AUTOMATIC OILER

Oil is kept at constant level in the crankcase of automobile or other gas engines by an automatic gravity feed now on the market. A float in the system drops with the oil level, opening a valve which lets lubricant flow from the reserve tank into the crankcase until the normal level is restored. The float-control rod then presses a ball on the seat shut-off to stop the flow. Vibration of the engine is neutralized, so far as the oil feed is concerned, by a tension spring pressing on the top side of the float-control rod. The action of the feed-valve may be regulated.



Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

West Side Terminal
 Cont. Stanley W. Todd
 230 Park Ave
 New York

Wm. H. E. Siegmund
 1009 S. Hope St.
 Los Angeles, Calif.

A 2479

Maker. Fred, Quindone
370 ne 79th st

POPULAR MECHANICS

439

Miami, Fla

Left this address
4/19/32



© International News Photos

Here's the Latest Vehicle in Water Sports; Pedals Like Those on a Bicycle Are Connected to a Propeller and the Craft Is Driven by the Operator's Feet; Pontoons Add to Its Safety

METAL CANOE DRIVEN BY FOOT, LIKE A BICYCLE

Propelled by pedaling like a bicycle, metal canoes, or sub-water cycles, have been tested successfully in Florida. The canoes have water-tight pontoons at the side, back and front, are made of aluminum and are said to be unsinkable. A propeller at the back is turned by pedals.

LINERS GUIDED BY SEA BOTTOM INSTEAD OF THE STARS

Transatlantic liners, on the most dangerous part of their course, will use the ocean bottom instead of the stars as a guide. The United States coast and geodetic survey has issued a new chart of the ocean floor around Georges Bank, off the New England coast, and this map will be compared with readings of echo depth finders on ships. So well does this chart describe the hills and valleys beneath the water that the navigator will be able to determine his position by speedy soundings and so keep on the right course. This method of navigating will eliminate much of the danger of crossing the Georges Bank in fog, when ships must be guided between the hills which rise close enough to the surface to ground many vessels. A

large submarine valley, eleven miles long, two and one-half miles wide and 2,000 feet deep, was found in the 1931 survey. The tops of its ridges are 600 feet below the surface, while at its mouth, on the edge of the shelf, the depth drops to 6,000 feet.

HAND TOOL IRONS OUT FENDERS QUICKLY AND CHEAPLY

Dents in the body and fenders of an automobile may be ironed out quickly and cheaply with a hand-operated tool now ready for the market. Special training is unnecessary for operation of the device, and a saving in time is claimed by its makers. A length of twenty-four inches enables the tool to reach the center of any door panel on passenger cars.



Hand-Operated Fender Tool That Irons Out Wrinkles in Automobile Body

Huron Machine Works
Huron, Mich.

Scene scene 12/19/32

2289 7
440

Aerocar Company of Detroit
POPULAR MECHANICS

Dry-Land Yacht Has All Comforts of Home



Left, Roof of Luxurious Auto Trailer Owned by Henry L. Doherty, Showing Doors in Top to Form Upper Deck; Right, View of Kitchen and of Roof with Top Laid Back



Full-Length View of the Land Yacht Attached as a Trailer to an Auto; in Circle Arc Shows the Living Quarters and Pullman-Bert Sleeping Accommodations



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Leapt. Glass Technology

Science

POPULAR MECHANICS

441

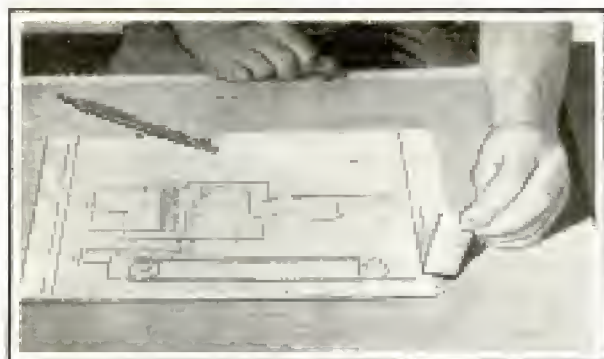
ELASTIC ARMOR- PLATE GLASS IS UNBREAKABLE

While it has long been known that the strength of glass can be greatly increased by toughening the surface through rapid cooling, it is only recently that this glass has been produced on a commercial scale. An English manufacturer has termed the product "armor-plate" glass and calls it the strongest glass known today. A plate of this glass, one-quarter of an inch thick, three feet long and one foot wide, supported at the ends, will carry a weight of 336 pounds at its center, deflecting two inches by bending as the weights are applied, but coming back to normal when the load is removed. This glass may be used for the same purposes as present safety glass, which consists of two layers cemented together.

Q 2460

TAPE USED ON DRAWING BOARD INSTEAD OF THUMBTACKS

Transparent tape for holding down the drawings of draftsmen is now on the market, offered as a substitute for thumbtacks. It is made of a material similar to cellophane, with one side coated with an adhesive compound which grips both paper and wood surfaces firmly, yet can be stripped from either without leaving a mark. The tape may be used repeatedly.



Paper Is Held Firmly on Drawing Board by Tape Instead of Tacks

Engine Hietzgen
2425 Sheffield Ave
Chicago



Small Weights Hung on This Bridge Model Reveal the Strain Which May Be Applied Before Collapsing Point Is Reached

WEIGHTS TEST MODEL BRIDGE FOR LOADS AND STORMS

Strains and stresses of bridges are predetermined at the University of California's laboratory by means of weights which are attached to parts of model bridges. Load and storm tests are conducted on a sixty-foot model, which is subjected to the same strain that a 100-mile gale would impose on an actual bridge built to the same scale.

RADIO PROGRAMS PUT ON FILM LIKE TALKING PICTURES

Sound on film, the secret of the "talkies," has been adapted to radio broadcasting in Austria. The device is literally a phonograph with films instead of records. The General Electric company in the United States has experimented with the sound film to the point where a program two and one-half hours long may be broadcast without changing records, stopping the film or shifting from one film to another. Austrian broadcasters are using the device to catch American programs coming in late at night. The films are then developed, printed and put on the air ten to fifteen hours later.

Christian Science Monitor

12/1/31

Philip H. Fletcher, engineer

Schneegloby

Q2375
Bruce Museum Bruce Park
Greenwich Conn

In a WORLD

As a Fly Sees It

Right, Two Beetles Battling to the Death over a Banana, While the "Lady" at the Right Awaits the Result; Below, the Dragon Fly's Smile; Note Its Great Eyes



By P. G. HOWES

DESPITE the news of crime and disaster daily before us, our world is as tame as a pet rabbit compared with another world that lies all about us, a world in which the inhabitants, from birth until death, spend all of their time in one violent, merciless battle against other members of their tribe. This is the world of insects, where life itself is almost always dependent upon the destruction of others. It is a world where fighting, killing, pillaging and cannibalism form the accepted creed of all the successful.

Let us spend a day in this land of blood-thirsty creatures that we may get a true idea of what a tame and simple and well-protected world we human beings really live in. Let us be ordinary flies for the simple reason that we shall be agile and fleet of wing, and thus we shall be able to get about easily, and our compound eyes, made up of hundreds of separate facets, will enable us to observe things thoroughly and at the same time keep us out of the

gravest dangers. We have no more than started upon our journey when a loud droning overhead, like that of a gigantic airplane, comes to our experienced ears. Without looking up, we dart for cover as the sound grows stronger. It is deafening and high-pitched and the great shadow which circles over our hiding place fills us

with terror, for we know that it is only one of hundreds of great carnivorous hawklike flies that are ever mercilessly killing and devouring our kind.

The monster circles about, a great bristly thing with huge eyes and a long poisonous saber protruding from its head. Its eyes penetrate the grassy forest where we are hiding, then suddenly the creature swoops down like lightning, and in another instant it has borne away one of our brothers who was not hidden quite as well as we are.

We come forth cautiously and are about to take off when an enormous yellow fleshy mass shoots out at us through the grass. The mass is covered with a thick



of TERROR

This Dragonlike Creature Is a Beetle Caught in the Act of Committing Murder; Its Victim Is a Fly That Was Caught Feeding on a Bit of Fruit



layer of entangling mucus which holds whatever comes in contact with it as though it were a powerful magnet.

It is the tongue of a great amphibian monster of our world, a thousand times our bulk. Its horrible tongue engulfs one of us and snaps our unfortunate brother back into a cavernlike mouth as we fly off in wild confusion, thinking only of saving our lives.

After a time we find one another again. We are one less, but that is not so bad considering our world, and after resting and recovering from our fright, the desire for food returns with increasing insistence.

After flying some distance, we spy some soft pears that have fallen upon the ground, a tempting meal for us. Already there are bees and black and white hornets, twenty times our size, feeding there. We will give them a wide berth, for they love to tear off our wings and then mince us into hash for their young ones, but they are partly

drunk now, and if we are on the alert, we may eat at another pear near by.

Other flies are hovering near, and, when they see us approaching, there is a wild rush to be first at the feast. We are out-distanced by the larger flies whose intention it is to keep us away once they have landed upon the prize. Two big bluebottles are the first to arrive and we are close behind, but suddenly there is a stampede for safety and all is panic and commotion.

A gray form, moving with lightning speed darts out from its hiding place beneath the pear. It is long and slim and glistening, its fangs are wide and heavy

and curved like two orange-colored sickles. Rearing up like a dragon, it pounces upon one of the bluebottles. It crushes its head and almost with the same movement spears the other upon its sharp tusks.

It is noon now and food is an absolute necessity. We turn our thoughts to flowers, but there are many traps among the blossoms.



A Wasp That Is a Terror of the Insect World; It Can Kill Creatures That Are Twice Its Size



soms. Here the big crablike spiders lie concealed with their bodies perfectly camouflaged to match their surroundings. Even the blossoms themselves are dangerous sometimes. Some contain fluids that trap us, others hold us fast until we die of starvation, while still others are the abodes of parasites which attack us. At length we obtain some nectar from a friendly flower, and as we sit sunning ourselves upon a leaf afterward, we hear a disturbance below. Looking down, we witness three highway robbers at work. One ant is fighting hard for its property, which appears to be a baby ant, but the others are merciless. There is no such thing as law and order or redress in our world, and so the smaller ant is tortured into giving up its burden, but at this instant a gigantic feathered creature swoops down out of the air, and in the twinkling of an eye all four ants and the young one are swallowed.

Hoping for an hour of peace, we fly away across the country to

new scenes, but as we descend to rest partly exhausted, we find that we have come down within sight of a great insect battle in which tens of thousands of warriors are engaged. It is a frightful sight. The whole of antdom appears to be in the seething multitude, as wave after wave of the combatants surge here and there, back and forth across the field of battle. They are linked in twos and threes and fours in desperate hand-to-hand fights, tearing at each others throats and legs and bodies like mad creatures that have lost all control of themselves.

From our perch, aloof and safe from the onslaughts and the strife

below, we see the mandibles of these ant warriors closing in deadly grips about the waists or necks of opponents, and once they close, not even death will open them. No quarter is shown, no instincts of mercy succor the wounded and dying. It is a war to the death without consciousness of why.



Top, Mandibles of Army Ant; Center, Fly Feeding on a Victim; Below, the Toad, a Monster to the Insect World



Above, Dead and Dying Ants after a Battle; Right, Bird Skeleton Cleaned by Army Ants

Being weak-bodied flies, all but defenseless and surrounded by enemies, death and destruction wherever we turn, we are terror-stricken most of the time. Life is hardly worth living in such a world. But our brothers in the tropics face still worse. Down in the jungles there are many additional dangers and enemies. There are those dreaded army ants that surge through the forests in millions, tearing every living thing to pieces. They respect no other breathing creature.

Q2569

MOON WEAKENS RADIO WAVES

Veteran radio operators, who long have held the theory that a full moon weakens distant signals, are right. In thousands of tests, it was found that reception invariably was at its best when the moon was below the horizon. As soon as it rose, reception fell off fifty per cent. Little difference was noted whether the moon was beclouded or not, whether new or in the last quarter. According to Orestes H. Caldwell, former member of the Federal Radio commission, the moon apparently

newspaper Service



has collected a considerable negative electrostatic charge from the electrons poured upon it with the sun's rays. Such a moon, passing over the earth's Heaviside reflecting layer, would induce a charge that would depress and distort the layer, making a sort of bulge. This interferes with the reflection of radio signals.

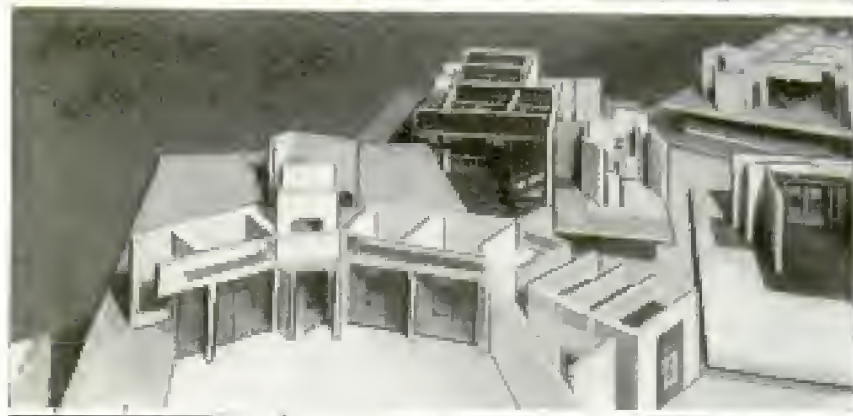
Bureau, Natural. Hall
Publications, 330 W. 42nd St.

A 24 78

Max Fleischer
studios art
director



Movie Sets First Are Built in Miniature. Then Every Detail Is Checked for Mistakes Before the Real Scene Is Constructed



HOW MOVIE MISTAKES ARE CORRECTED IN ADVANCE

One of the greatest time and money-saving pursuits in the motion-picture industry is said to be the practice of constructing models of every "set" in advance of actual production. This permits a thorough study of camera angles, lighting effects, property arrangements, and, in short, corrects many mistakes before they are made. After the models are completed and approved, the full-size set is built, incorporating changes that have been found helpful in the study of the models.

DANGER OF FROZEN DYNAMITE REDUCED BY RESEARCH

Frozen dynamite, the substance that has caused so many deaths and injuries in America's mining industry, promises to be eliminated as a result of recent chemical findings. Dynamite has a freezing point of

fifty-six degrees Fahrenheit, twenty-four degrees higher than water. When placed in position, frozen dynamite is likely to be detonated by the friction of handling and tamping, or may burn, rather than explode, throwing off deadly gases. Thawing it is extremely dangerous. For many years the process of making dynamite or explosive jelly has undergone no change. Finally the old principle of lowering the freezing point of water by adding salt was thought of. Further investigation showed that this property of lowering the freezing point was not confined to inorganic salts, but that many organic substances had the same effect. The use of the principle in bringing about a lower freezing point for dynamite came by accident. In munitions research, T.N.T. was developed, leaving a

tarry residue. The dynamite makers decided to try it as a binder for their product. To their surprise, it was found that it lowered the freezing point. Recently ethylene glycol has been produced by the petroleum industry and widely distributed as an automobile anti-freeze.

LEVEL THAT FITS YOUR POCKET ALSO CONTAINS A RULE

Rules and levels are used at the same time so much by woodworkers that a handy pocket tool combining the two is now being offered. It consists of a six-inch rule with a level set in its center, and takes up no more space than any other similar tool.

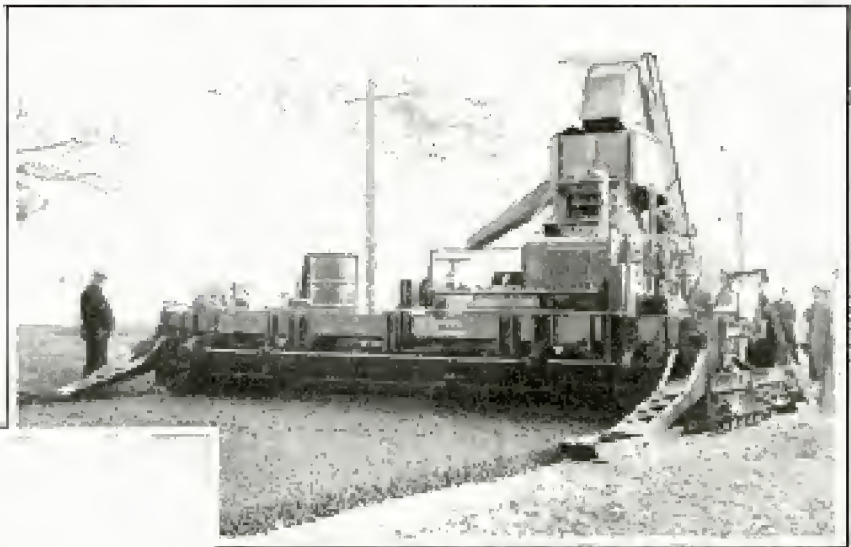


Emb. Loretta Spring,
1924 N. Capital St
Washington D.C.

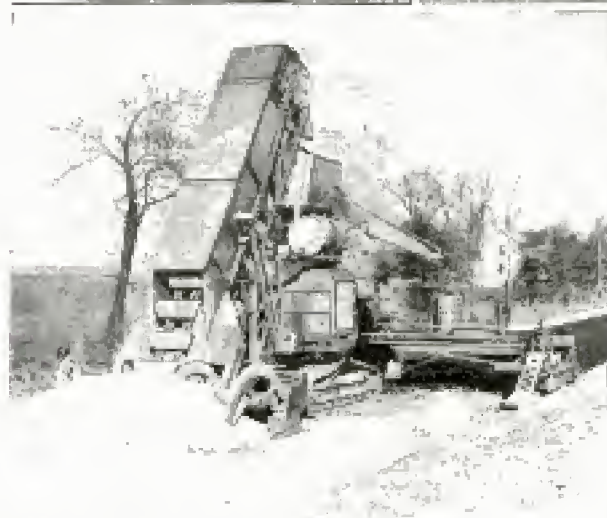
The Underway Level Co
5715 N. Commercial
Chicago

Road Monster Lays a Mile of Paving a Day

Paving now is mixed, spread and tamped in one continuous operation with the aid of road machinery recently demonstrated in Illinois. The machine is in two sections, each of which can be operated independently of the other. The crushed stone first is spread on the site of the



Rear and Front View of Machine That Paves Whole Road Width in One Operation without Forms



new paving by a special truck that measures the quantity needed. The mixing machine then starts at one end, "gobbling"

up the aggregate and mixing it thoroughly with bitumen. From the mixer it is passed to the spreading and tamping machine, which in the Illinois demonstration was connected directly to the mixer. The material is spread to the correct depth and tamped with a force of 6,000 pounds. Special leveling shoes, on the outside edges, iron out uneven spots in the roadbed, and the apparatus automatically lays the material to make a crown in the center. No forms are needed. The machine builds one mile of road a day.

THREE CURRENTS ON ONE WIRE CONTROL HOME DEVICES

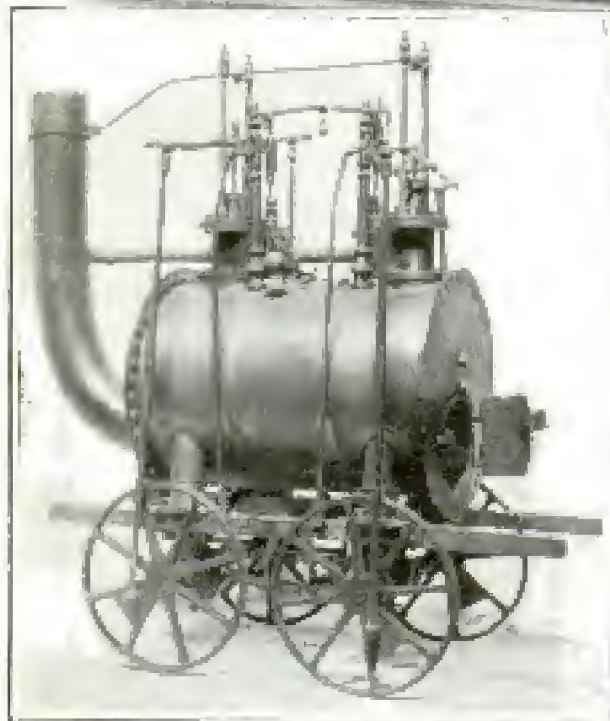
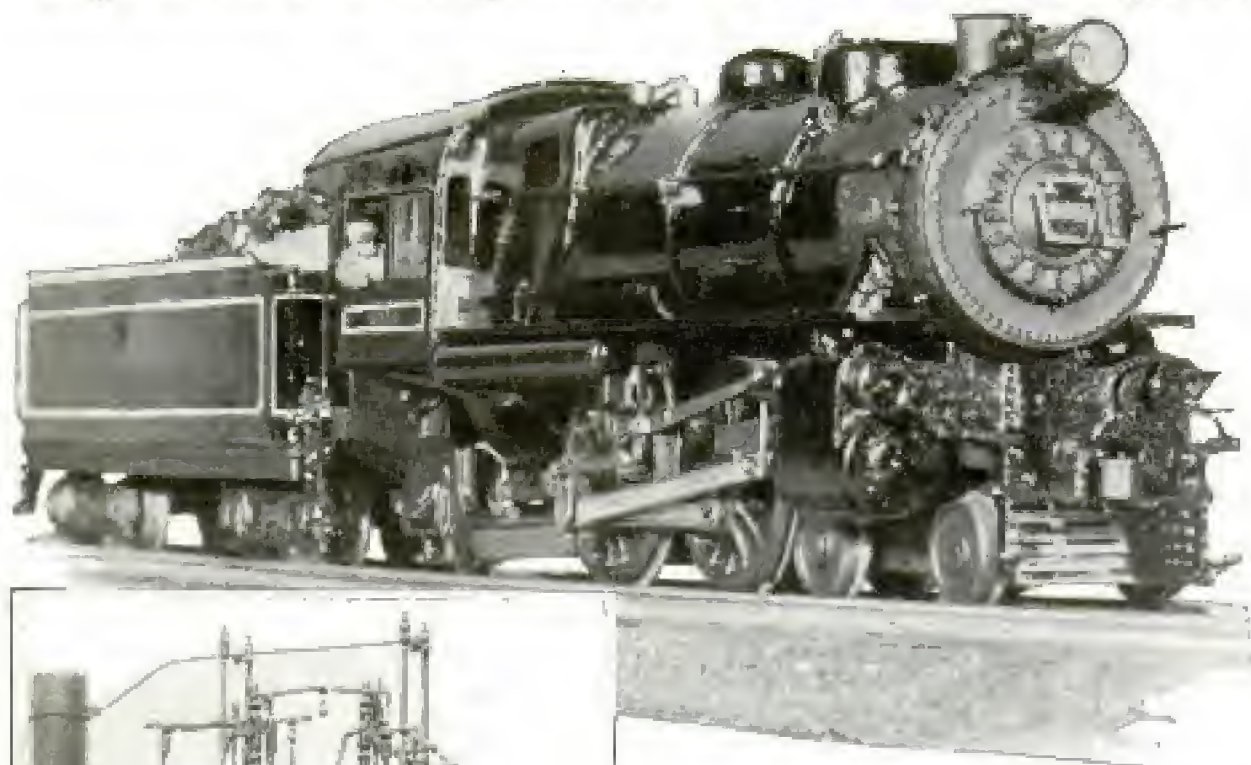
Electric water heaters and other home appliances can be turned on and off at specified hours by an extra electrical current sent over the same wires that bring the power to operate them, and controlled by an engineer at his desk in a distant power station. By the same development, announced by the General Electric company, 800 street lights in Springfield, Mass., are being lighted and extinguished from one central point with no extra wiring or hand operation of switches. The currents that do the control work, having different characteristics from that supplying power, travel on the same wire without becoming scrambled. The regular power currents in general use travel at

sixty cycles or 120 alternations per second, while the message-bringing currents have much higher frequencies. Those for controlling water heaters, for instance, use a frequency of 720 cycles. With such a system, electric water heaters can be used at night when power is cheaper. The carrier currents will turn the heaters on when the demand for power is light, the water heated at night being stored for use during the day. The carrier currents are the same form of electrical energy which, superimposed upon high-voltage currents, is sent over high-tension transmission cables for telephone communication. Engineers claim it is technically possible to "crowd" a transmission wire with many carrier currents without mutual interference between them or with the regular service current.

Science Service 12/5/31

Q 2421

Stephenson's Engine Model Valued Highly



Model of Stephenson's Engine, and at Top, Scale Model of Modern Locomotive

In the archives of the Franklin Institute in Philadelphia will be found what is probably one of the most important locomotive models in the United States. It is Stephenson's own model—a working one, too—of his locomotive which hauled a train of thirty-four cars at a speed of ten miles an hour on the first public railroad which was opened for traffic in England on Sept. 27, 1825. The model was brought to the United States by an engineer named Strickland, after he had been sent abroad to report on railways, then something very

new, and it practically marks the beginning of railroads in America. In striking contrast is a modern engine, a one-fourth-inch scale model.

LIMIT TO SPEED OF AIRPLANES 2497 SEEN BY EXPERT

Belief that airplanes in the stratosphere would be able to travel at almost limitless speeds and consume little power has been shattered by Prof. Alexander Klemm, of the Guggenheim School of Aeronautics. "Even if the engine power is fully maintained in rarefied air of great altitude, there is a definite limit to the speed at which a plane can fly," he stated. "It is entirely premature at this time to talk of speeds of 1,000 miles per hour. It should, however, be quite possible to double the top speed of the transport plane, and instead of cruising at 150 miles per hour it should be possible to fly at 300 or even 500 miles at 60,000 or 65,000 feet. For such flying, the engine will have to be supercharged with extreme care and the cabin will have to be made air-tight and provided with means for compressing the air and delivering it to the occupants." Two planes along these principles are now being built, one in Germany and one in France.

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POPULAR MECHANICS

Phila

CIRCUS ELEPHANTS AID IN BUILDING ROAD

When modern equipment bogged in soft spots after several weeks of rain, circus elephants were given the job of helping build a highway between Houston, Tex., and the coast. For the first twelve weeks after the road was started, rain retarded the contractors. Trucks could not be moved through soft places in the right of way, cars on a short railroad spur track could not be switched and other heavy work was handicapped. Then the contractors made arrangements with a circus near by, and the elephants were put on the job, enabling the work to proceed at a rapid rate.

VIOLIN WITH KEYS LIKE PIANO HAS ONLY ONE STRING

Producing the sixteen different notes necessary in playing the average church or popular music, a violin with only one string and with a piano keyboard has been developed. Lacking violinists but having plenty of one-finger piano players, a Sunday-school orchestra leader adapted the piano keyboard to the violin to produce what he calls the "violano."



Piano Keys on This Violin Make It Easier to Play;
the Instrument Has Only One String



Elevator Tower Built in Bahia, Brazil, to Transport the City's
Population from Lower to Upper Level

MOVING A CITY STRAIGHT UP TASK OF ELEVATORS

Giant express elevators carry most of the pedestrian traffic between the upper and lower sections of Bahia, Brazil. The business section of the city borders the bay, while the residential district is on top of a hill 195 feet above. Engineers of the Otis Elevator company were consulted and, at their recommendation, the monumental LaCerde tower was built of reinforced concrete, 240 feet high, and connected with a structure on top of the hill by a bridge. The tower houses two large elevators comparable in size and speed with those in American skyscrapers.

Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.

Manufacturers Review 12/17/31

A2519

Houston, Tex.

City of Bahia, Brazil

Spencer in
Harlem City

A 2498

260-11th Ave New York City

Sole agent - Wm. J.
Quezmore, 918 Madison
Ave. Camden, N.J.

A 2485

450

International Harvester Co
606 S. Michigan Ave
POPULAR MECHANICS
Chicago

Radio Tractor Controlled by Key Plows Field



Receiver Attached to Tractor,
Top; Plowing Field by Radio,
Center, and Sending Apparatus
Controlling Tractor's Movement

cessed as feasible. Operation of stationary machinery by radio from the house could be easily accomplished. The apparatus consists of a low-wave broadcasting plant with loop aerial, receiving set and small battery-operated motors for driving the steering wheel, moving the power lift, shifting the gears, and so



The plowing of an entire field by a radio-controlled three-plow tractor was witnessed recently by a crowd in Indiana. A motor truck carried the controlling apparatus in the demonstration, but it was pointed out that it could easily be installed so one operator could drive one tractor and control another by radio from his seat. Possibility of controlling the radio tractor from the farm home without leaving the house also was dis-

on, and selective switch and relays to place the motors in operation. The selective switch has a number of points, and each time the telegraph key is depressed, the radio impulse causes the switch arm to move to one of these. Each controls a separate function of the tractor.

Book by J. J. Lynch, Miles City, Mont

BLACK CARBON AS A WHITENER IS MODERN MIRACLE

Carbon, in its normal state one of the blackest substances, has been known since the fifteenth century to possess peculiar properties of purification. Earlier users, however, knew only of the charcoal form of carbon, made from wood, the most common form, and bone. Boneblack still maintains a position as the key material in the refining of raw sugar. In recent years, materials have been discovered,

known as "activated" carbons, made from vegetable substances and twenty to fifty times more powerful than the charcoals previously known. The activated carbons are made by charring vegetable matter and then removing all hydrocarbons deposited by the process. It is the hydrocarbons that previously limited the activity of the carbon as a purifier. One of the peculiarities of activated carbon is its ability to decolorize almost any solution. It is also used in the manufacture of gas masks, where it likewise acts as a purifier.

Booklet "Activated Carbon" by C. L. Mantell,
Ph.D., Consulting Engineer, corp. Technical material
Industrial Chemical Sales Co., 230 Park Ave. New York

Farrell

A 2544

Samuel Scardon,
Curator of Minerals
Academy of Natural Science

POPULAR MECHANICS

OPAL CHIPS FLOATING IN BALL MAKE A GIANT "JEWEL"

Opals an inch in diameter would be worth a fortune, but a gem that size can be made from a number of smaller and imperfect opals, or even from opal chips. It has been found that the play of colors in the opal is almost perfectly matched by the refraction of glycerin. Small glass balls, about an inch in diameter, are blown and filled with glycerin containing small opals or chips. When sealed, the small stones send out their beautiful play of colors, aided by the glycerin in which they float. Because of temperature changes and the floating characteristic, the pieces are constantly in motion and present an even more dazzling display than does the actual jewel.

Q2530

HOUSE MOVED ACROSS A RIVER WITH AID OF BARGE

Army engineers were faced recently with the job of moving a large frame house across the Delaware river from Fort Mott to Fort Du Pont, and decided it would be easier to float the structure across than to tear it down, move it piecemeal and reconstruct it. The house was loaded onto a large barge, which required twelve hours, then ferried across the stream to its new location, the actual water journey requiring only one and one-half hours.

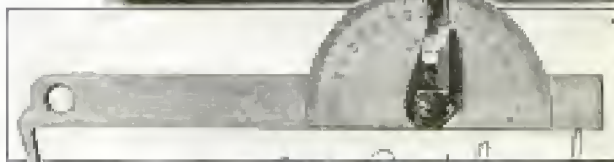


© International News Photo
Moving a Frame House across a River; the Dwelling
Was Loaded on a Barge and Floated

Philadelphia

Q2541

451



Hamley Co. LaTour
Propeller-Pitch Gauge in Use, Above, and Below, a
View of the Time and Money Saver

HOURS OF DELAY SAVED PLANE BY PROPELLER GAUGE

The pitch of an airplane propeller now can be accurately measured without removing it, and in only a few minutes' time. This is the result of a gauge invented by J. Wesley Smith, of Philadelphia. The operation of checking and adjusting propeller pitch always has been a time waster, usually expensive, and often one which required the propeller to be shipped long distances to have the work done. The gauge in appearance is something like a precision protractor combined with an L-square. It is light in weight, small in size, and easily operated.

Q2506

ROTATION AIDS WIRE DRAWING

Less power is required in wire drawing if the drawplate is rotated, scientists at Manchester University, in England, have discovered. The saving in power is proportional to the speed of rotation. At 3,300 revolutions per minute, the power was reduced one-fourth. No structural differences between the rotated wire and wire drawn in the old way were found.

Metal Research Dept.

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Technical file
12/19/31

Q227 Scardone St
Hermantown

Chalmers Hotel Philadelphia

A 2425 Cmk. Walter E. Burton
1032 Florida Ave
Akron, Ohio

The Latest MIRACLE



Superior Plant
Industry, Washington
D.C.

ly independent of seasons,
is so easy that almost any-
one can do it. The trick
lies merely in controlling
the length of time during
which light falls on the
plant.

Many a farmer and flow-
er grower has wondered
why a chrysanthemum
does not come out with
the violets, for instance.
Until a short time ago, they
concluded that it was a
matter of temperature, and
perhaps other factors,
which they could not very
well control.

Then the government
scientists took up the prob-
lem. Dr. W. W. Garner

and other plant
experts observed
that, when a
plant is moved

CAN plants tell time?

Why do some flowers bloom only in
the spring?

Can poinsettias that normally display
their blossoms only at Christmas time, be
made to bloom in the spring?

All these questions have been answered
by Uncle Sam's plant wizards who have
learned how to juggle vegetables, flowers
and fruit so they seem to have lost all
seasonal habits.

They have learned how to make spring
flowers bloom all summer. They persuade
poinsettias to burst forth in June, and
ordinary spinach, under their guidance,
obligingly produces great, curly leaves
until fall.

This process of making plants seeming-



Above, Covering
Black Cloth to
Sooner; Right, Drooping Cosmos Plant That Was Kept
in Darkness

Chrysanthemums with
Induce Them to Blossom
in Darkness

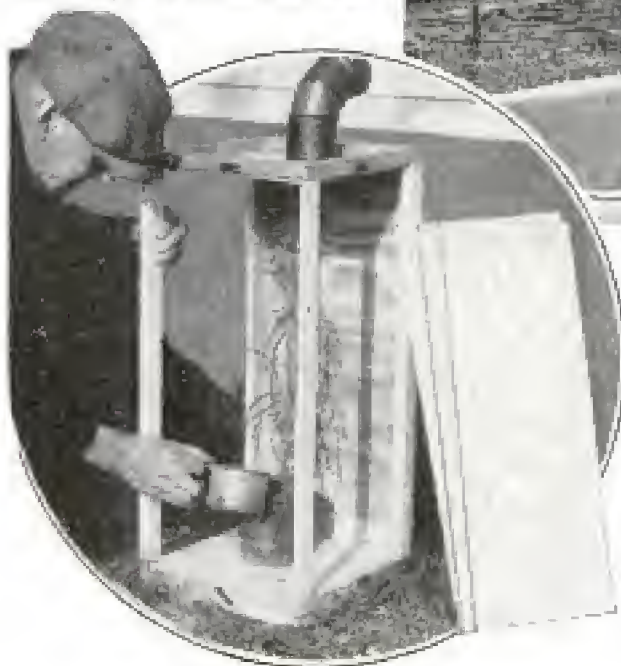
Dept. of Agriculture

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of the PLANT Wizards

from one latitude to another, it often changes its habits entirely, blooming during a different part of the year, or exhibiting some other new characteristic.

Experiments soon indicated that the behavior of plants is not entirely a matter of temperature or other seasonal features usually associated with plant growth. The problem of plant behavior was



Courtesy William Telcher, Inc.,
Above, Growing Water Plants under 1,000-Watt Lamp;
Left, Box to Force Blooming of Plants

attacked from the standpoint of light duration, with some surprising results. Early experiments were conducted by placing test plants on steel cars which could be run into or out of a light-tight shed. Thus the hours of daylight exposure were regulated.

Soy beans germinated on May 17 and, growing in normal daylight, required 110 days to produce flowers. But they needed only twenty-six days to flower when the daylight ration was cut down to seven hours. By reducing the light period, chrysanthemums were made to flower in summer instead of fall, late dahlias were advanced several weeks, and poinsettias,

usually found in bloom at Christmas, were forced to flower in August. Later, in studying plant response to light, the hours of light exposure were shortened by means of special boxes having removable panels, which could be placed about the growing specimens.

But it is not always to advantage to shorten the duration of natural light. Plants which blossom in midsummer or where days are long during the flowering period, require an increased light diet. This is best attained, at least experimentally, by suspending electric lamps above them and burning these after the daylight period has ended. Fortunately the intensity of light need not be great. Many plants respond nicely to the stimulus from forty-watt lamps. Winter annuals require long days in which to produce flowers or fruit. Plants taken from the field in the fall were placed in a greenhouse and provided with electric illumination from darkness until midnight. In fifty-five to sixty days, they were in full bloom. Control iris plants, not given the additional light diet, did not flower until June.



Top, Growing Easter Lilies under Artificial Light; Below, Measuring Growth of Lettuce under Lights

Plants can be grouped generally as long-day and short-day varieties. The former are those which produce flowers or fruit as the season advances into summer, with increasing day length. Short-day plants blossom or fruit in early spring or fall,

when daylight hours are fewer. When it is desired to advance the flowering period of short-day plants, the length of summer days can be artificially reduced. Likewise, long-day plants can be made to flower out of season by increasing the light duration. By reducing light duration, growers of spinach have been able to produce plants that remain in the rosette stage indefinitely, like annuals, instead of going to seed. Uncle Sam's experimenters also determined how a plant will grow when one part receives more or less light than another.

By building a box around the top of a cosmos plant, hours of daylight could be reduced, while the bottom portion remained in normal light. In this way, flowering of the top half occurred in midsummer, while the lower half blossomed when October came. Then conditions were reversed, and the lower part flowered in summer, while the upper half waited until the normal time arrived. The upper

and lower thirds then were put on a restricted light diet, while the middle was allowed to grow normally. The top and bottom produced flowers first, while the middle remained inactive until the flowering season came in October. Hence it was concluded that, in some plants at least, the effect of light is strictly localized; and that, when all parts of a plant are subjected to same daylight, the controlling of one section does not affect another appreciably. Experiments when part of a plant is kept in darkness indicate that the effects of light extend to adjacent parts when these

and not in the middle. It is a little early to outline all of the ways in which the knowledge of light duration and its effect on plants can be put to work, but a few

Water Plants Grown under Electric Lights and Chrysanthemums Brought In Earlier by Use of Black Shades



Courtesy Ohio State University

Prof. Allen Lawrence

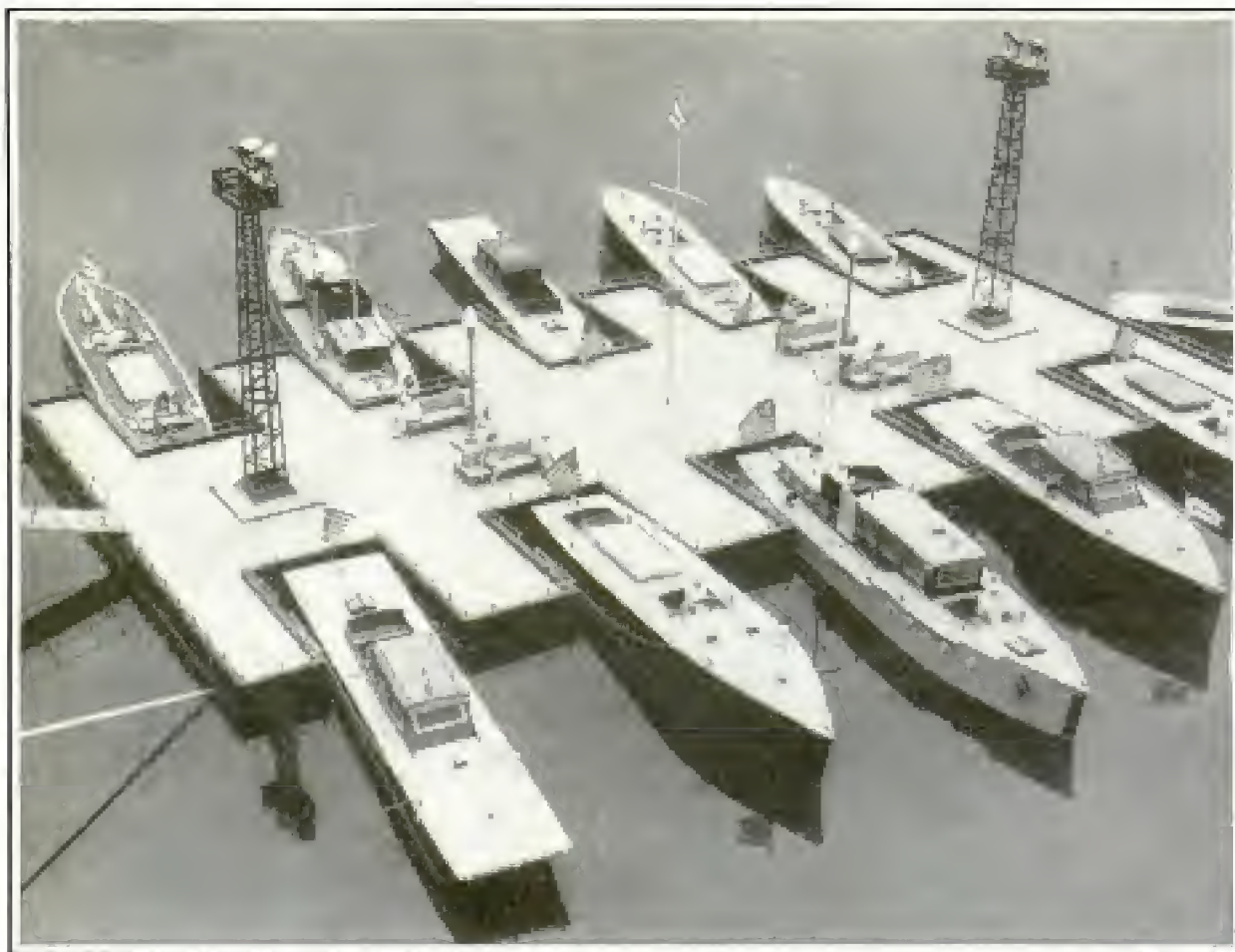
are dark, and that continuous darkness itself will not hasten flowering.

The department of agriculture experimenters further found that an increase or decrease of light, to be effective, must be made at the beginning and end of a day,

applications already have been made.

Florists, simply by darkening their greenhouses for a little while each day, can speed up the production of chrysanthemums which otherwise might be late; or by lengthening the day with electric lamps they can delay flowering until Christmas. They can grow violets throughout the entire summer by taking away some of the light.

Now, also, strawberry growers have a means of determining just where a new kind will do best. Specimens are put through tests to find out how many hours of light they require a day, whether they have a rest period, and what effect temperature has on them.



Model Boat Landing Built for a Miniature Speed-Boat Regatta; the Yacht Dock Accommodates Ten Boats, Each Two Feet Long, and Is Complete Even to the Light Towers

YACHT DOCK FOR MODEL BOATS ACCOMMODATES TEN CRAFT

Models have been built of nearly everything, and now a miniature boat landing has been constructed in California, complete in every detail, even to light towers and a landing platform. The dock accommodates ten model boats, each two feet long, and was built for a miniature speed-boat regatta in Los Angeles.

PERFUMES SOLVE MAIL THEFT WHEN PUT IN MUCILAGE

Perfumed mucilage recently solved a baffling series of mail thefts in the southwest after the robberies had been narrowed down to one of six post offices. Packages and letters had been opened, their contents removed, and resealed. After several months of work, an inspector hit upon the plan of perfuming the mucilage pots of each of the six post offices with a different scent. When the next opened letter was examined, he mois-

tened the flap, sniffed it, and announced that he soon would solve the mystery, as he now knew which of the six offices involved harbored the thief.

(250)

BOOK PRINTED ON PAPER STRIP READ WITH "LORGNETTE"

Every author can be his own publisher if he uses a printer and reading machine developed by Rear Admiral Bradley A. Fiske which enables a 100,000 word novel to be printed on two strips of paper about as long and wide as an ordinary newspaper column. The cost of such a "book" would be about five cents and it could be sent anywhere in this country for the price of a two-cent stamp. The process of making the book is simple. First, the manuscript is typed on a sheet of paper about two-thirds the width of an ordinary letter head. At the end of each twenty-third line—the average length of a book page—the typist jumps a space and begins the next. The typed script goes to a

Q 2587
Capt. Everett Spring, 1729
N. Capitol Bld. Washington
D.C.

U.S. N. retired
Hotel Commodore
New York

at Echo Park, Los Angeles, Cal.

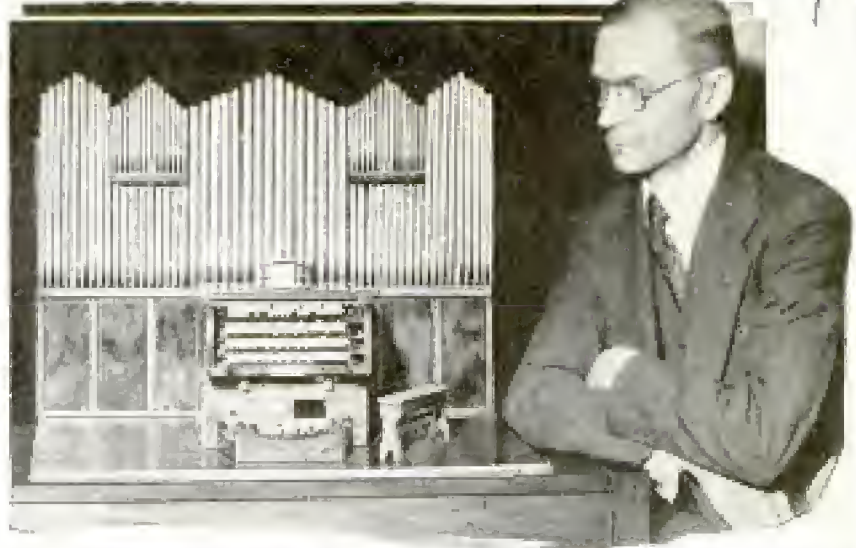
A 2540

E. W. Ruggs
30 Carroll St
New York, N.Y.

POPULAR MECHANICS

457

photo engraver who reduces it to one twenty-fifth of its size. The author takes the four plates, one for each side of the two strips of paper, to a printer and in a day or so can mail out his book. To peruse the volume, however, requires a reading machine which likewise is inexpensive. It weighs less than four ounces and resembles a lorgnette in size and shape. It has two lenses but a shield can be used to cover one while the reader looks through the other. The machine is held on the nose, and after a page is read, the thumb of the hand holding it turns a screw to bring the next "page" on the strip of paper into view. After reading the first 25,000 words on one side of one of the two strips of paper, the reader reverses the paper and peruses the other side. It is claimed that there is actually less strain in reading through the lens with one eye than in the ordinary manner with both. It is believed the process will make available many technical works which now never see the light of day because of the cost of printing.



This Midget Organ, Complete in Every Detail, Really Plays; Electricity Operates a Blower Which Causes Reeds to Produce Notes

MINIATURE PIPE ORGAN PLAYS, BUT BY ELECTRICITY

Complete in every detail, even to the 108 keys only one-fourth inch wide, a miniature pipe organ which is played by electricity has been constructed. The keys and pedals of the organ are workable, but will not cause the organ to sound because the making of miniature magnets and air valves would be too difficult. The instrument is equipped with a small motor driving a blower which operates on a set of reeds to produce chords of pure organ tones. The pipes are eighteen inches high and twenty-four inches wide, while the console measures seven and three-quarters inches high, seven and three-quarters inches wide and seven and one-half deep. The pipes are bronzed.

Using a Reading Machine to Peruse a "Book" Printed on a Paper Strip



EVEN SPACING OF CORNSTALKS PRODUCES BIGGER CROP

If corn is planted in evenly spaced hills, one plant to a hill, the yield will be improved in several respects. Dr. George H. Dungan, of the University of Illinois, has found that this method produces a greater grain yield, greater uniformity of plant size and weight of ear and earlier maturing. Doctor Dungan tried raising the same number of stalks per acre that is customary under the present practice of planting two or more seeds in hills about three feet apart. But instead of bunching the seed, he spaced them evenly and gathered a bigger crop.

American Society of Plant Physiologists

Arbano, D.L.

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yet a market
6/15/02

From EUROPE to NEW YORK

By G. H. DAVIS

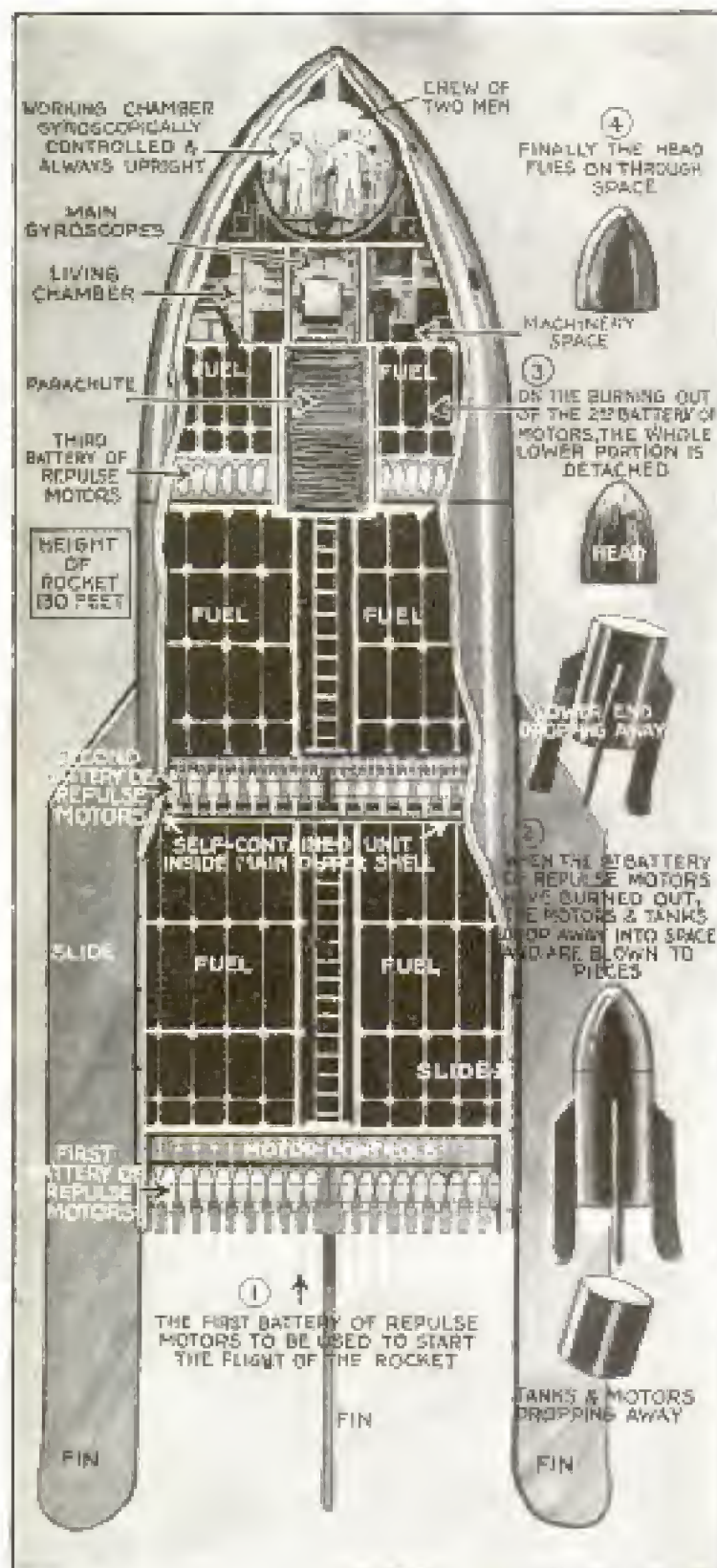
(Special correspondent who recently was commissioned by Popular Mechanics to visit the Raketen Flugplatz, the world's first rocket airbase near Berlin, to learn what has been accomplished there.)

ARE we within measurable distance of a rocket post from Europe to America in which special-type rockets will be able to carry a considerable amount of urgent mail and parcel post from Berlin to New York in about twenty-five minutes?

So much has been said about rockets in the last few years, so many extravagant promises have been made for them, that the enormous technical difficulties in the way of developing these new sources of power for useful ends has often been lost sight of. Along with all this talk, fortunately, experiment and research of the most dramatic kind have been in progress. For two years engineers and experimenters all over the world have been endeavoring to master the innumerable obstacles in the way of success, and now their efforts are beginning to bear fruit.

Only last summer the first conquests were made in the long campaign which may lead to the development of mail and freight-carrying rocket projectiles, rocket-powered passenger lines girdling the world, and perhaps even interplanetary exploration. These are the ultimate dreams of practically every worker in this field, and now for the first time they seem to have been brought within the range of possibilities, from an engineering point of view.

These first steps have consisted principally in finding ways to overcome some of the difficulties in the use of liquid explosive fuels. Ordinary skyrocket-saving rockets, and many experimental rockets, including



Drawing by G. H. Davis

Drawing Giving Some Idea of What a Rocket Designed to Carry Two Men to the Moon and Back Would Look Like, as Suggested from Data Known at Present

by ROCKET?

Shall We Soon be Sending
Mail Across Ocean in
Twenty-Five Minutes?



Left. Testing Small
Rocket Motor in Metal
Container; Below,
Experimental Rocket
Motor Developing Fifty
Horsepower

cently sent to an altitude of six miles by Reinhold Tiling at Wandergog, Germany, are driven by a variety of gun-powders. This composition, burning at a rapid rate, generates the gas pressure necessary to drive the rocket.

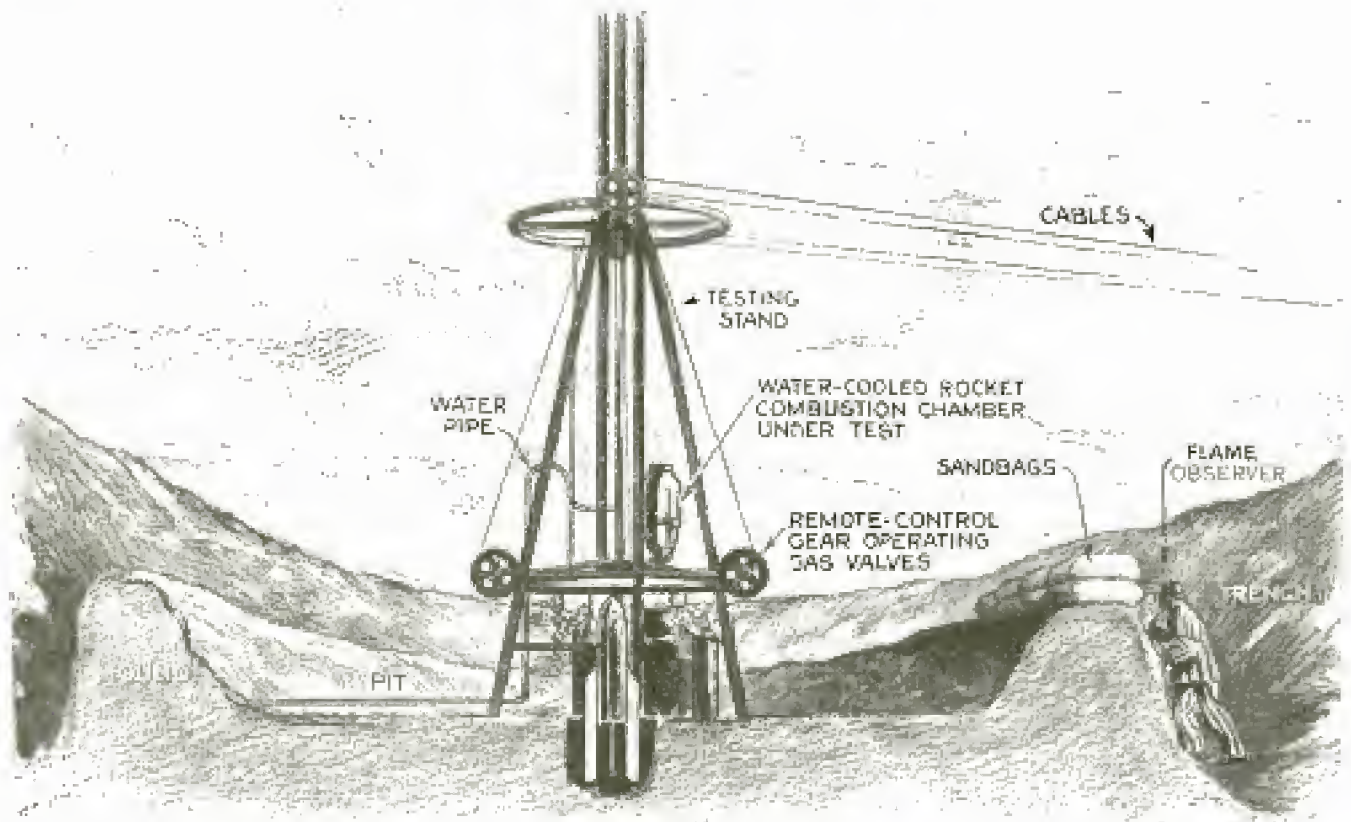
But these fuels are useless in large rockets for several reasons. In the first place, there is no simple way to control the speed of burning. An even more serious objection is that dry fuels have been shown by experiment to be too weak for the needs of long-distance rockets. One of the first rocket engineers to call attention to the fact that these difficulties might be overcome by using liquid fuels was Dr. Robert H. Goddard, the great American rocket experimenter. Almost at the same time Prof. Hermann Oberth in Germany, and Robert Esnault-Pelterie in France, published results of their own researches pointing to the same conclusions.

The fuel of a rocket, whether powder or liquid, must burn with extreme rapidity; so fast that, if it were to depend upon the oxygen of the air for combustion, it would not work at all. Pyrotechnic fuels, such as are used in skyrockets, include chemicals which liberate the necessary oxygen during the heat of the explosion. If we use liquid fuels, such as gasoline, we must supply not only the fuel but



© Pendray

also the necessary oxygen. Thus one of the liquid fuels must always be liquid oxygen, for obviously the best way to carry oxygen in a rocket is to use it in its liquid state. Liquid oxygen is cranky and dangerous stuff, boiling at the frightfully low temperature of -182 degrees centigrade



Drawing Indicating the Elaborate Precautions That Must Be Taken to Protect Men and Equipment during Rocket Tests in Germany, Owing to Limited Knowledge of What May Happen

and exploding violently from its own gas pressure if confined in a tank at ordinary room temperatures. Consequently there is a serious problem in the control of this volatile fuel under the conditions present in a rocket, where the temperature in the oxygen tank is about -185° and in the combustion chamber, only a few inches away, that of an oxyacetylene flame.

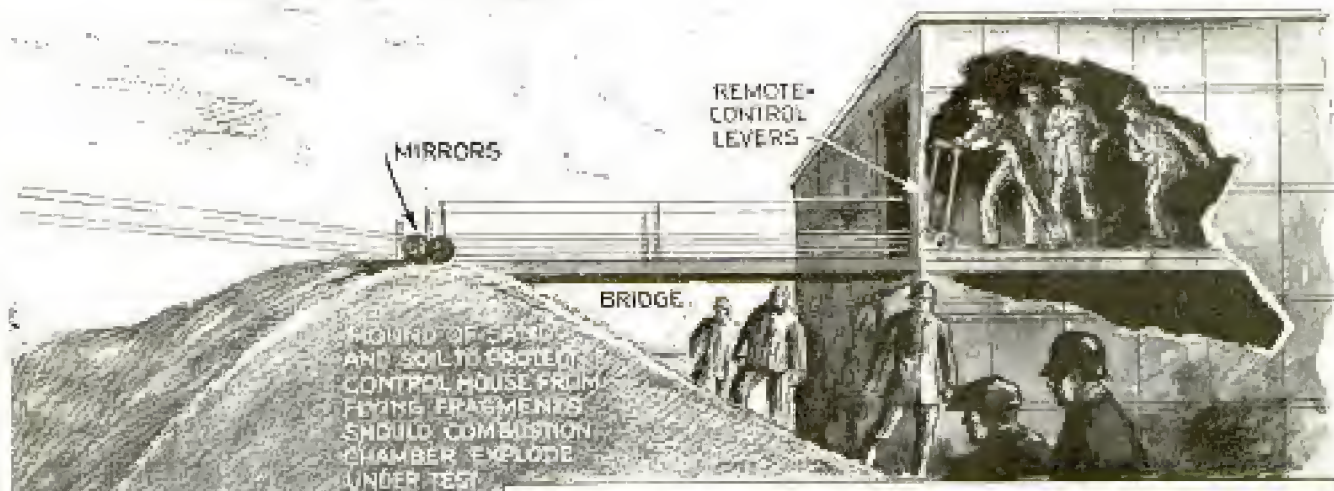
Another problem is how to get the liquid fuels into the combustion chamber of the rocket against the frightful heat and explosion pressure there. The fuels must, of course, be introduced rapidly and steadily to keep the reaction pressure steady. This calls for some kind of pumping apparatus, yet any type of mechanical pump would add greatly to the weight of the rocket—perhaps so much as to overcome the advantage of liquid fuels over dry fuels.

Finally, the change to liquid fuels brings up innumerable questions relating to the rocket motor itself. What is the best shape? What materials must be used to withstand at the same time high pressure and intense heat? How can the motor be kept cool to prevent melting or bursting?

At what points and in what direction may the fuels be introduced, and in what proportions? Finally, what should be the shape of the nozzle, and how long should it be? These problems are still not completely solved, though engineers are now working on liquid-fuel rockets in at least seven countries.

The first liquid-fuel rocket ever to fly is believed to have been shot by Doctor Goddard near Worcester, Mass., on July 17, 1929. This rocket, burning oxygen and a hydrocarbon fuel, the exact nature of which has never been revealed, made a successful flight and landed by parachute. But its performance has since been so far surpassed by the German rockets that the credit for solving the major problems of fuel pumping and control must apparently be given to the engineers of the Raketen Flugplatz, or rocket-flying field, at Berlin.

This field is the property of the Verein für Raumschiffahrt, or German Interplanetary society. The thousand or more members of this society support the work at the flying field, and six full-time engineers are employed, under the direction of Rudolf Nebel and his assistant, Klaus Reidel.



As might have been expected, it was at the Raketen Flugplatz that many of the major advances in harnessing liquid fuels to rockets were made.

It has certainly been demonstrated that liquid-fuel rockets can be built and will fly, and also that the efficiency of the rocket motor, when properly constructed, is very great.

The motor used by the Germans in their experiments is actually only about the size of an egg, and somewhat the same shape, with a nozzle about two and a half inches long. The whole apparatus may be concealed in the hand. Built of duralumin, it weighs somewhat less than half a pound. Yet it will deliver a lift of over thirty pounds, and is capable of hurling a fifteen-pound rocket nearly fifty miles into the air in one minute if sufficient fuel is provided to keep coming going so long.

of the Raketen Flugplatz rocket, capable of an twenty-

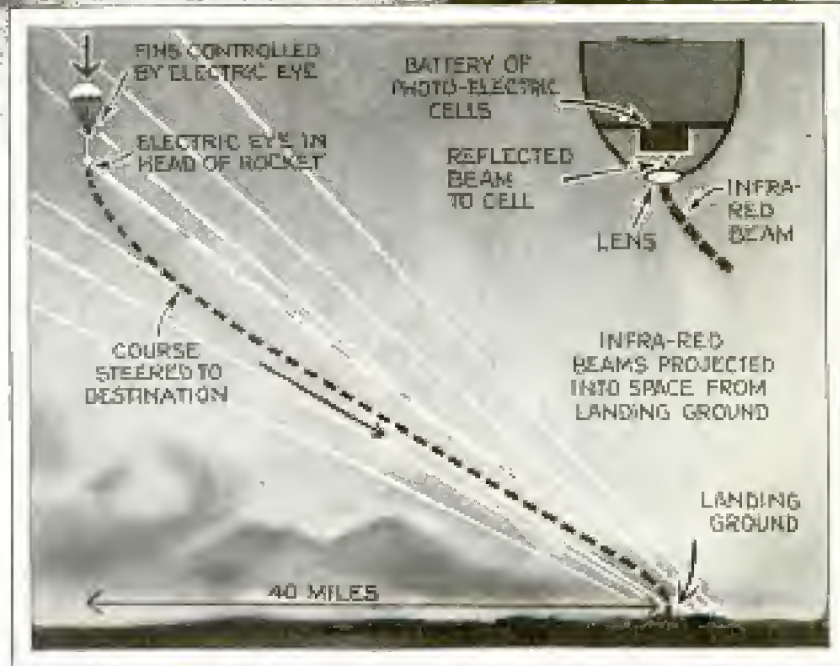


Diagram Showing How It Is Proposed to Use the Electric Eye, or Photo-Electric Cell, to Steer a Rocket to Its Destination

chute to bring the whole apparatus down safely. This rocket will have three motors, each about eighteen inches in length, and each capable of lifting 180 pounds. It will be possible to build a rocket weighing about a quarter of a ton, which will have an acceleration of about thirty-two feet per second and a range of many miles, depending upon the amount and type of fuel carried.

The next problem to be solved in rocketry is the difficult one of flight control. It is now mechanically possible to build a rocket capable of crossing the ocean, but as yet we have no apparatus which will guarantee that it would land where di-



© Pendray

rected. Some kind of light, efficient and automatic steering device must be invented which will control the rocket in flight and bring it down at the proper point. To date, almost no experimental work has been done on this angle of the problem, because the first task obviously was that of constructing a liquid-fuel rocket which would fly at all.

So far the European engineers have made the greatest strides in solving the rocket problem, but we may confidently expect that the next great advances will be made by Americans. Already experiments are being carried on in the United States in at least four widely separated places. Doctor Goddard is working silently at his laboratory in New Mexico, aided by a fund of \$100,000 made available to him by the late Simon Guggenheim. In San Francisco, another member of the American Interplanetary society, Cleve Shaffer, is building his fourth experimental rocket motor. A third experimenter is Harry W. Bull, of Syracuse, N. Y., who is carrying on his work in the laboratory of the University of Syracuse, and will soon build a rocket to test important theories of his own in relation to flight stability and control. A fourth experimental project is that of the American Interplanetary society, near New York City,

where a rocket is now being built under the direction of Edward Pendray, David Lasser and H. F. Pierce. Dr. H. H. Sheldon, of New York University, is also aiding with this project.

At any one of these four points of experimentation the important idea may be developed which will lead to positive control of rockets in flight. When this has been accomplished, it is only a matter of time until the stratosphere will be explored by rocket projectiles, and until rockets will be flying from city to city and across the ocean, bearing mail, express and even passengers. When these objec-



Above, Copper Lining of a Small Rocket Motor; Below, Pouring Liquid Oxygen into a Test-Stand Tank

tives have been reached, the next step will be the problem of sending a rocket out into space, to the moon or to another planet.

It is well known that to escape earth's gravitational pull, a rocket must travel 250 miles of the earth's surface to the sea, to the sky, to the moon, to the planets.

113 W. 42nd
New York

vehicle would also not only have to lift itself away from the earth, but also have sufficient energy to continue to combat the earth's pull, a pull that continues—with diminishing intensity 'tis true—to infinity. Therefore it will be seen that the propellant must be of enormous power-for-weight to lift the rocket through the atmospheric belt into free space.

It has been figured that a flight across the Atlantic would require a rocket forty-six feet in length, driven by at least half a dozen motors and that it must climb right up through the atmospheric belt to a height of 300 miles. So definite are the scientists in the accuracy of their calculations that they claim there will be not more than a fifty-mile error at the end of the flight; that is, the rocket will be within fifty miles of its destination should it be allowed to fall directly to earth.

But to get over this error efforts are being made to perfect gear for guiding the rocket "home." Scientific people in Berlin have now constructed photo-electric cells sensitive to infra-red rays. Experiments are being made to project the rays to considerable distances and guide the falling rocket to its point of destination by means

of an "electric eye" in the head of the rocket.

To arrest the free fall of the rocket, a special type of parachute has up to the present been found to be the most satisfactory fitment, though vanes somewhat like those of an "Autogiro" airplane have been tested.

It may to us seem inconceivable that man will ever fly, at a speed undreamed of today, vast distance through space, for the moon is a minimum distance of 240,000 miles away, Mars 50,000,000 miles and Venus 26,000,000 miles distant from the earth. But what would our grandparents have thought if someone had told them that man would be flying at 400 miles an hour in 1931 and others talking across the world by wireless telephony, or using the hundred and one other scientific wonders that are just everyday playthings of today.

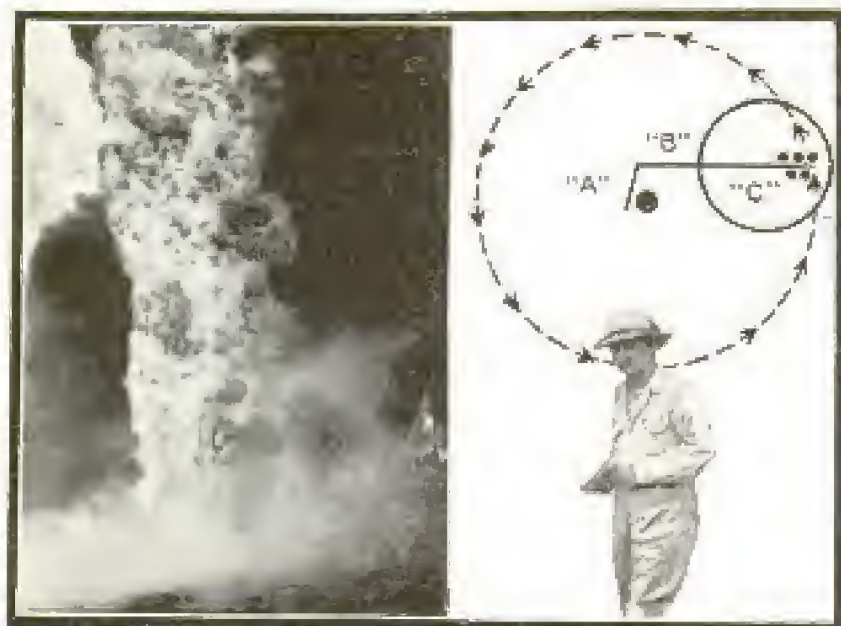
These people of the rocket science, not only the German enthusiasts at the Raketen Flugplatz, but many men in other parts of the world, are not just dreamers, they are skilled scientists and engineers who are helping forward the progress of the human race, and that is all there is to it.

WRENCH HUNDRED FEET LONG HELPS END OIL FIRES

A wrench with a wire-cable handle 100 feet long recently was employed in ex-

tinguishing an oil-well fire in Texas. The outlet pipes around the casing were melted off. Hugh L. Patton, a teamster who has become a fire expert, began operations by placing his special wrench around the

"Christmas tree," as the maze of outlet pipes is known, attaching his hundred-foot handle and unscrewing the pipes until the flow was confined to the main outlet. Then he brought into play another of his devices, a nozzle operated by a steam shovel with a long beam. The shovel pushed the nozzle into the pipe that runs into the oil sands, and water under pressure was pumped in. When it reached the oil sands, it displaced the oil in the casing and put out the fire.



How Men "Walked" Wrench: "A," Well; "B," Handle; Inventor Below

Inv. Hugh L. Patton, Evertor

Copyright material

Cont. Esuy Nomia, 42493
 % Leonard Meacham
 85 Rockrose

WAVES HIGHER IN SOUTH SEAS THAN IN NORTHERN

Careful records kept by hydrographic offices of several governments have established the fact that ocean waves seldom reach a height of more than forty feet in the most severe storms. On very rare occasions they have been measured at eighty and ninety feet, tidal proportions. Seas produced by the same degree of wind, however, will rise higher and have crests at greater distances apart in southern latitudes than they will in northern sections. Gales in the north will cause waves from thirty-five to forty feet in height, with crests three to four hundred feet apart, while in the southern hemisphere the gale will cause seas to run between forty and forty-five feet in height, seven hundred feet apart. The reasons given are the nature of the southern storms and the distribution of the land, which is greater in the northern hemisphere. Most northern storms are of cyclonic origin and are quickly beat down by shifting wind, while in the south the wind blows almost constantly from the west. Waves appear much higher to the ocean traveler because of the rolling.

STOP SIGN SINKS IN PAVEMENT AS AUTO PASSES OVER IT

Disappearing stop signs that sink into the pavement as cars pass over them are being used in California. These warnings are made of cast iron and are fitted into a recess in the road surface. They are balanced by weights beneath the pavement which lift them into view as soon as the wheels have passed.



Signal Equipment Co.
 47 85 Dupont Ave
 Los Angeles, Calif



Steel Tanks of Special Design Are Used to Store Up Steam Generated in Slack Periods by Swedish Plants

TANKS BUILT TO STORE STEAM FOR RUSH HOURS

Storage tanks for conserving steam have been constructed in Sweden to equalize the load of producing plants. Steam manufactured in slack periods is stored in the reservoirs to carry the heavy burden of rush hours.

"FOOLS' GOLD" BURNED AS FUEL WHERE COAL IS SCARCE

Iron pyrites, the glittering metal known as "fools' gold," have been discovered to have potentialities as a heat-producing element. Experiments in South Africa near mines where there is a shortage of fuel have been so successful that the iron sulphide now is to be burned to generate steam. The chemistry of the combustion is simply the formation of iron oxide from iron sulphide, with its accompanying intense heat. The method is particularly effective in districts where copper is mixed with the pyrite, as the copper can be recovered from the ashes. Three hundred tons of pyrite have about the same steam-producing ability as fifteen tons of coal, but the valuable metallic products recovered add to the efficiency.

The Ironing Magazine
 and the Ironing Magazine
 and the Ironing Magazine

dr. Dr. Johannes G. P. P. P.
 Swedish ironing

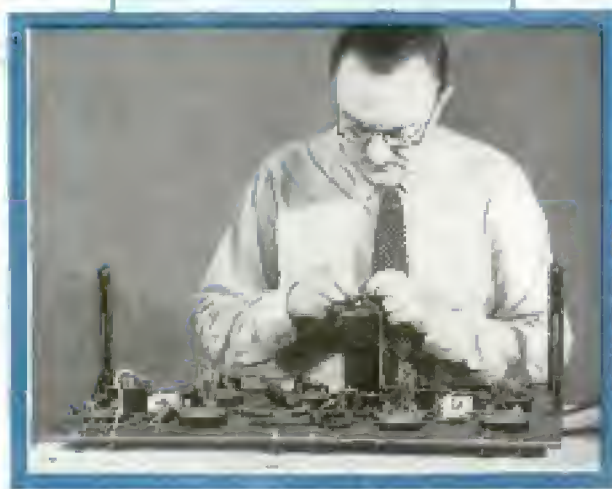
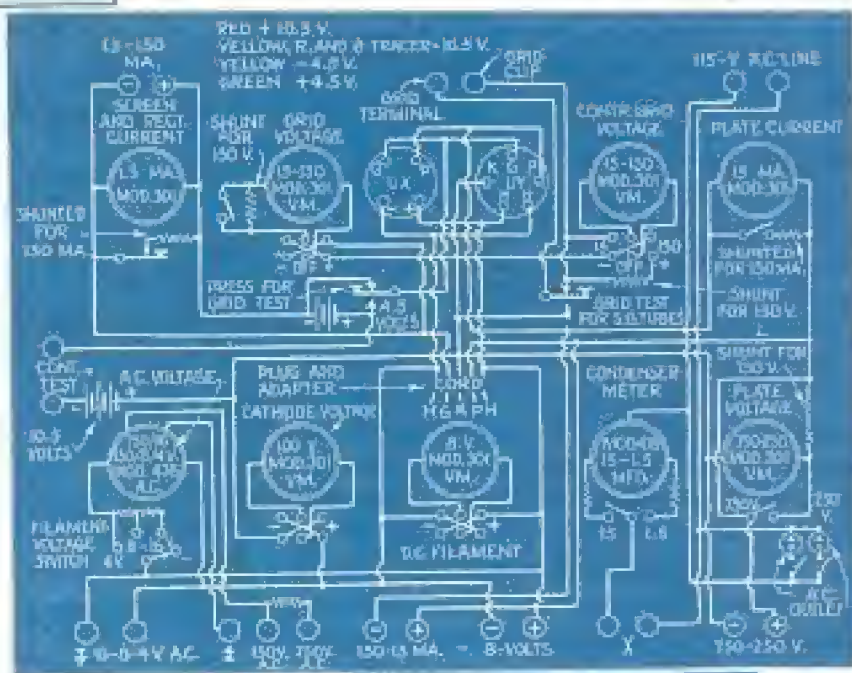
A Modern Radio Test Panel for Service Men

Easily Assembled from Standard Parts



Every radio-service shop should be equipped with a panel capable of carrying out any test of a receiver that is necessary for its operation. Commercial equipment of this type is often beyond the reach of the small shop, but a comparatively inexpensive set analyzer, with binding posts available for external tests, may be constructed from standard parts. The resistance values are all designed for Weston meters; if other instruments are used, the proper values would have to be obtained from the manufacturers. The bakelite panel is $\frac{3}{16}$ by 14 by 28 in., and can be bought cut, drilled and engraved if desired. Two shelf brackets hold the panel upright at the rear of the bench, as shown in the lower photo. The two small batteries specified are placed behind the panel, and the leads are identified for convenience according to the color code given at the top of the diagram. When ready for use, as shown in the upper photo, the tubes are removed from the receiver, one at a time, and inserted in either the 4 or 5-prong socket, and the cable plug into the socket in the set. In this manner, the tubes may be accurately tested under op-

erating conditions. Practically any receiving tube may be tested, if proper adapters are used. A material list is available. Rectifier and screen-current measurements may be taken; in all screen-grid tests, a short flexible lead is connected from the grid-terminal post to the cap on the tube, and another lead between the grid-clip post and the grid clip in the receiver. Grid-voltage measurements may be taken with the 150 positive range of the grid voltmeter for a screen-grid amplifier tube. This meter should be cut out of the circuit before inserting the plug in any



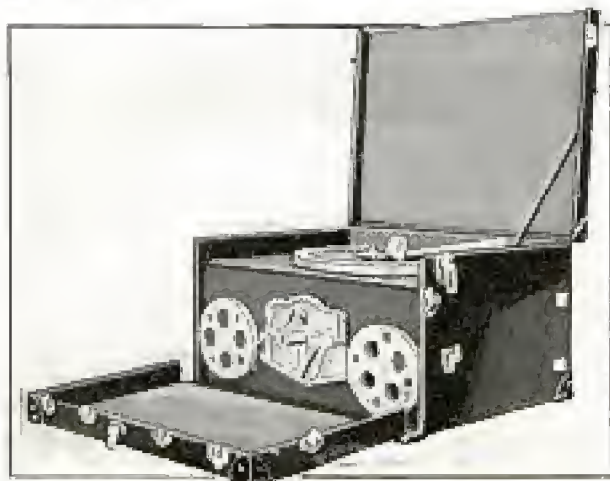
rectifier-tube socket. Other tests that may be made include determinations of control-grid voltage, plate current, a.c. filament voltage, cathode voltage, d.c. filament voltage, condenser and resistance measurements, d.c. plate voltage and continuity tests.

Improving Hand-Wound Coils

A piece of friction, or adhesive, tape on the thumb and finger will enable the experimenter to wind his coils evenly without the burning and chafing that usually accompanies this operation. This will not only protect the hands but will provide additional friction to keep the wire taut.

Talking-Picture Machine Is Portable

Talking-pictures for homes, clubs, camps, hotels and churches are now available by means of a small portable talking-movie machine employing 16-millimeter film and playing either standard or 16-in. talking-picture records. A medium-size transparent screen is supplied as a part of the portable equipment, but, if desired, a 7 by 9-ft. screen may be placed 25 ft. from the projector. A 250-watt lamp is used within the projector, and a small a.c. motor drives both it and the phonograph turntable. By means of an automatic device, the film and record are synchronized immediately upon starting the motor. The sound equipment consists of a powerful amplifier employing a screen-grid tube in the first stage, directly coupled to two type-45 power tubes in push-pull. A type-80 full-wave rectifier completes the amplifier unit.



Portable Talking-Movie Machine with Case Opened Ready for Use



Baffle That Serves Also as Locker Door, and Method of Mounting the Speaker

Hinged Baffle for Speaker

A swinging baffle for the dynamic speaker, at the experimenter's workbench, may be made to serve double duty as a locker door. Mounted in this manner, the speaker is readily accessible for repairs, adjustments or comparative tests, and takes up very little room. A spring catch, or the usual screen-door hook, may be used to latch the baffle.

Talcum for Locating Screw Holes

Variable condensers or similar parts with a shaft, or projection, extending through the panel present an awkward problem when mounting-screw holes are to be located for drilling. An easy method of locating them is to drill the hole for the shaft first. The shaft is then inserted so as to bring the frame of the condenser flat against the panel in position for mounting. A little talcum may then be placed in each hole in the frame and a slight tap with the finger will deposit it on the panel. The condenser is then removed and the holes marked with a scriber.

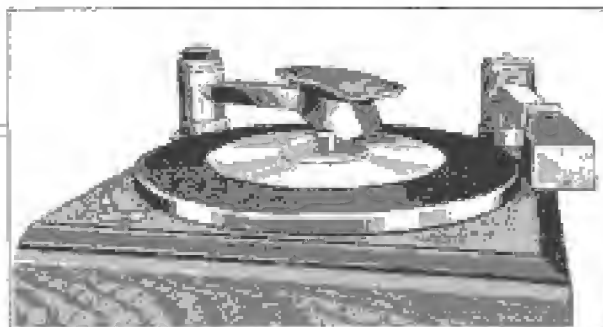
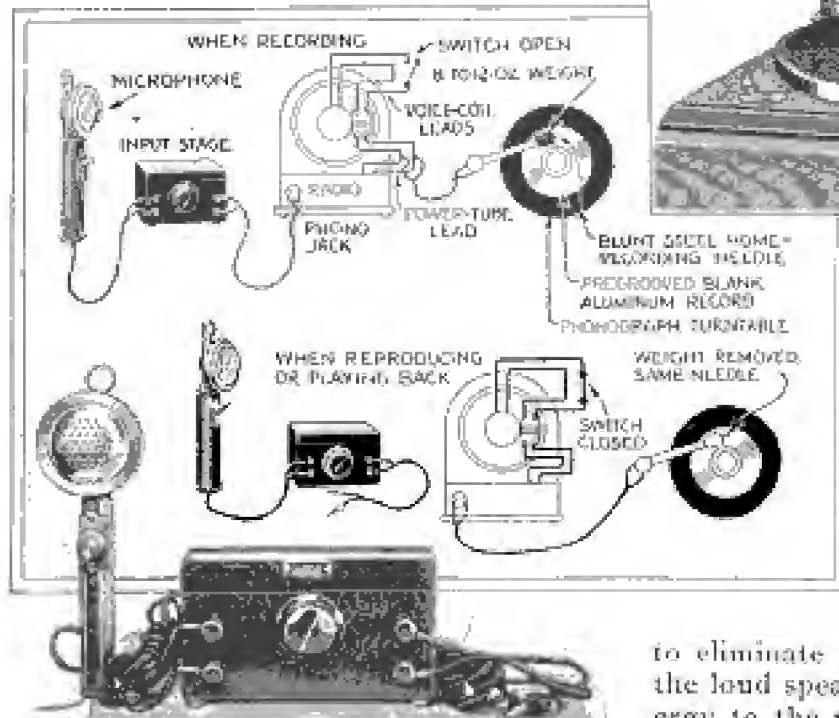
❑ Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are always available without charge.

*Talkiola Corp.
1600 Broadway
New York*

Simplified Home Recording

Home recording through midget receivers is now possible with the addition of a phonograph turntable, an electric pick-up arm and a microphone with an input stage or coupling transformer. These receivers

type equipped with a phonograph jack is used. A special home-recording needle, obtainable at any phonograph store, is



Upper Right, Turntable with Pick-Up Weighted by Small Bag of Sand for Added Pressure on Recording Needle; Lower Left, Hand Microphone and Input Stage

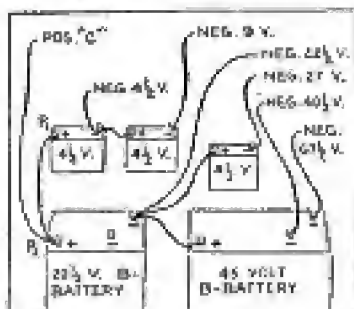
employed when playing records of this type. Therefore, if you receive a record through the mail, do not attempt to play it until you have obtained such a needle. In making records, it is necessary

to eliminate reproduction of the voice by the loud speaker and divert all of this energy to the phonograph pick-up. This is easily done by opening the circuit of the speaker voice coil and connecting the pick-up across the primary of the output transformer, as shown. Note that a single-pole switch is used for opening and closing this circuit.

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C-Bias from Batteries

Battery-operated receivers employing different types of modern power tubes sometimes present a problem to the novice when he desires to install a new set of C-batteries or change the set to use a different power tube, such as the 112-A or 171. The illustration indicates how to obtain practically any bias voltage. Two groups of batteries are shown, and it will be noted that the positive terminals at P₁ and P₂ are common. This positive lead is, of course, connected to



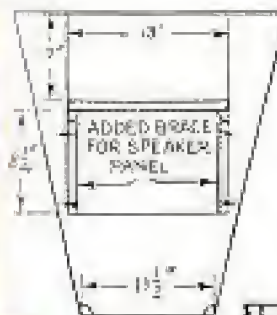
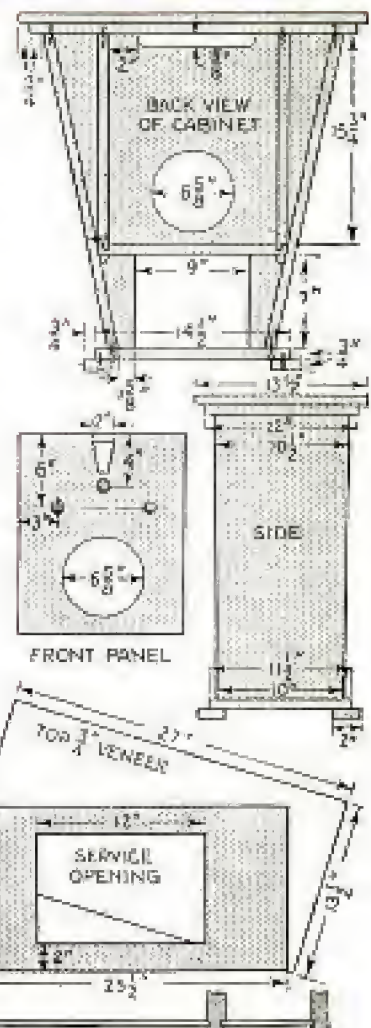
negative A. The desired negative voltages are then tapped off, as shown, according to what tube is used. The instruction sheet supplied with every tube gives a certain value of C-bias voltage for various plate voltages. Best results can be had only by following these instructions.

Light Bulb as Non-Inductive Resistor

Ordinary light bulbs are commonly used as resistors, but few radio amateurs know that a mazda light bulb makes a fine non-inductive grid suppressor for the transmitting tube. Anyone who has tried to neutralize a transmitter of any power will realize the advantage of using grid suppressors, and a more economical or serviceable resistor can hardly be found.

A Radio Cabinet and Humidor for Your Den

Where the radio need not be a conspicuous piece of furniture, the cabinet may be designed to serve several purposes. A small homemade a.c. set of the midget type, or a commercial chassis of the same description, together with a small dynamic speaker take up very little room. The cabinet to be described is modernistic in design and may be finished to harmonize with the other furniture. It not only completely houses the receiver but also provides room for a humidor in the lower compartment. Furthermore it is of suitable height to serve as an end table thus making an ideal radio installation for a man's den where space is usually at a premium. The construction is quite simple. The veneered-wood top is hinged to a secondary top in which an 8 by 12-in. service opening is cut for ventilation and easy access to the receiver. Thin felt pads are glued to the corners of the top. The frame of the cabinet is built of $\frac{3}{4}$ -in. pine where possible, all outside pieces being made of walnut, or mahogany, veneer. The panels are $\frac{1}{4}$ -in. veneer, the rear one being fitted with a dummy grill, for ventilating purposes. Air space is also provided at the top. The humidor is built to open at the rear. All mortised joints are glued and quarter-round strips are used to support the baseboard for the set. The joints are shown in the back-view sketch of the cabinet, and the screws are inserted so that the heads will not show. The dial arrangement on the front panel will depend on the type of receiver used. The speaker baffle, made of 1-in. close-grained wood, is mounted directly back of the speaker grill. The rear panel for the set and speaker compartments is easily removed by lifting upward and out at the bottom where it is held in slots.



CROSS-SECTION VIEW LOOKING DOWN ON TOP SHOWS PANELS FITTED IN GROOVES





Table Cabinet, with Center Doors Removed, to Show Set Panel and Phonograph Compartment

Table Cabinet for Phono-Radio

This homemade table cabinet was built to house an a.c. radio set and a phonograph turntable. The cabinet is placed on a library table and is trimmed and finished to match. Two small compartments at each end provide space for records, logs and writing material. The speaker is placed on top of the cabinet. A desk-lamp fixture is mounted on top of the speaker at the front, and a small candelabra lamp, with a reflector, above the phonograph turntable at the right.—L. C. Goodwin, Hornell, N. Y.

Screen Antenna for Small Sets

Miniature or "mantle type" sets employing screen-grid tubes have sufficient pick-up for locals to operate from a small indoor antenna. Where these sets are placed on a table, copper-screen wire may be tacked to the underside of the table to provide a good antenna. A Fahnestock clip can be soldered to one corner of the screen so that the antenna lead may be quickly fastened or disconnected as desired. Another idea, that makes the in-

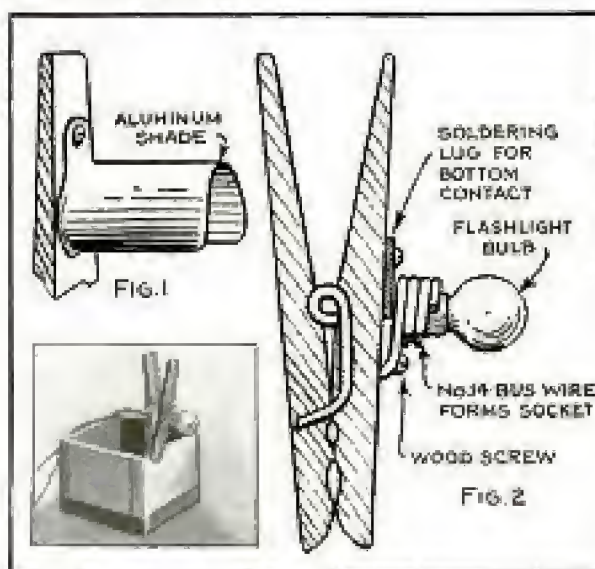
stallation really portable, is to cut a piece of bristol board to fit inside the sides and top of the cabinet. When cut to fit, the cardboard is removed and one side is coated with aluminum paint; a Fahnestock clip is then fastened to the painted side with a paper fastener. After the metallic paint is dry the cardboard is replaced in the cabinet and a short piece of flexible wire is used to connect the cardboard antenna to the set binding post.

New Photo-Cell Operation

Experimenters placing a new photo-cell in operation for the first time are cautioned not to apply full-rated voltage to the cathode at first. It is better to start with a comparatively low value and work up, at the same time observing the performance of the tube closely for any irregularity.

Handy Mounting for Service Light

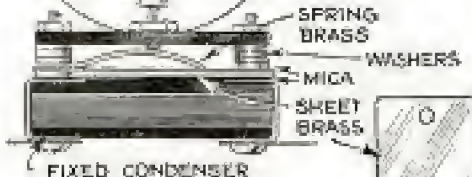
A clothespin of the spring-clip variety and a length of busbar wire can be used to mount a flashlight bulb so that it may be clamped in any convenient position. The aluminum shade, Fig. 1, is optional, but is useful for keeping the light out of the operator's eyes. Two short wood screws hold the socket and soldering lug, which forms the bottom contact, as shown in Fig. 2. Flexible rubber-insulated leads are soldered to the screw heads and terminate in small clips that are connected either to the filament supply or to a small flashlight battery.



Easy Solutions for Common Radio Problems

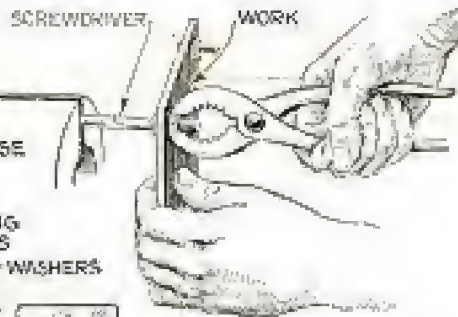


ADJUSTING SCREW AND NUT



FIXED CONDENSER

Fixed Condenser Made Semi-Variable with a Thin Brass Plate and a Smaller One of Spring Brass between Mica; Adjusting Screw Is Mounted on Fiber Strip



SCREWDRIVER WORK

VISE

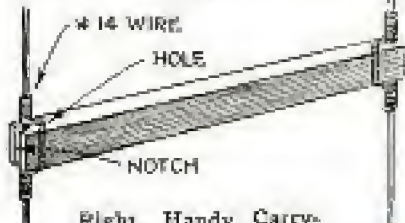
SPRING BRASS WASHERS



Screwdriver in a Vise Is Equal to Extra Hand When Tightening Hex-nut on Panels

Right, Combination A.C. and D.C. Amateur-Band Receiver Is Supplied with Three Sets of Band-Spreading Coils for the 20, 40 and 80-Meter Bands

Left, Spacers for Zepelin-Type Antenna Made from 10-In. Lengths of Kiln-Dried Wood and Thoroughly Boiled in Paraffin



Right, Handy Carrying Strap for Testing Instruments Made from Old Belt; Below, Useful General-Purpose Clips and Jacks for Test Cords Made from Small Spring Clips



Above, Heavy-Duty Resistor That May Be Used as a Variable Load for Testing Batteries, Meters and Other Equipment; Below, Easily Made Shield and Chassis for Small Units

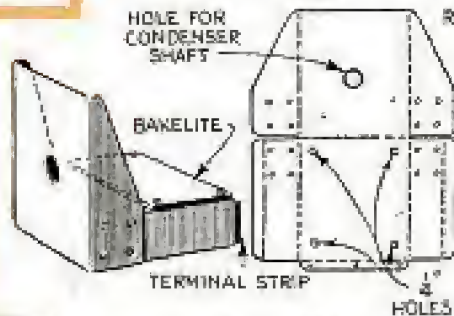


TIP JACK

BRASS STRIP

CUPS

TERMINAL



HOLE FOR CONDENSER SHAFT

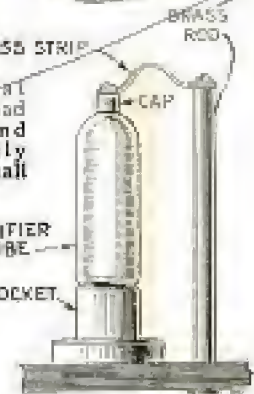
BAKELITE

TERMINAL STRIP

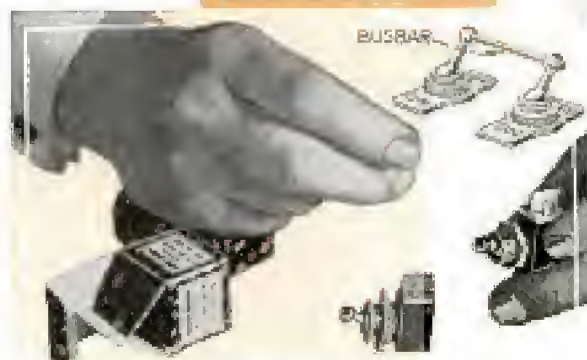
RECTIFIER TUBE

SOCKET

HOLES

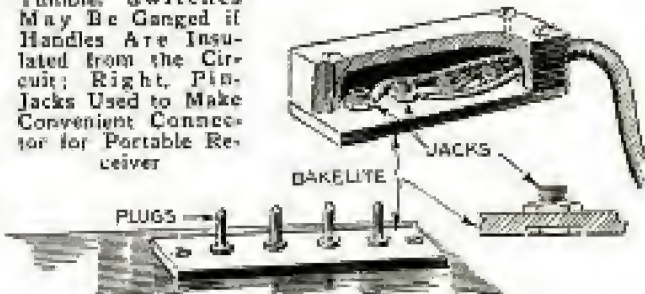


Above, Improved Terminal for Top of High-Voltage Rectifier Tubes; Copper Braid or Thin Brass Strip Holds Cap



BUSBAR

Left, Two or More Tumbler Switches May Be Ganged if Handles Are Insulated from the Circuit; Right, Pin-Jacks Used to Make Convenient Connector for Portable Receiver



PLUGS

BAKELITE

JACKS

Chicago, Ill. to Cleveland, Ohio, to
Cyclops Co. & S. S. P. 6 1/2 ft. 11 in.
9 S. Clinton Chicago, Ill.



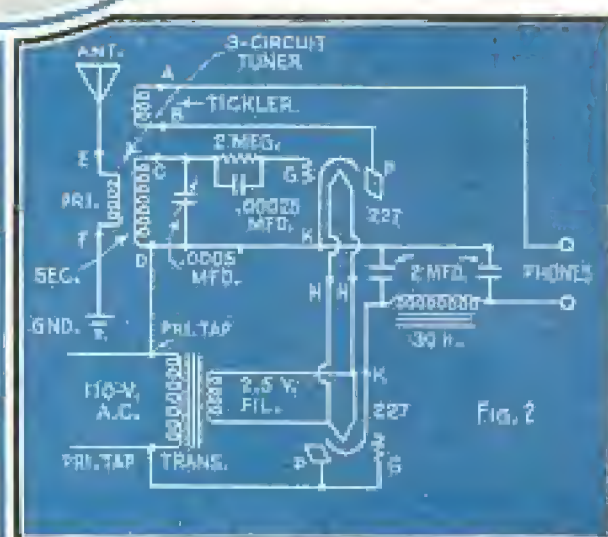
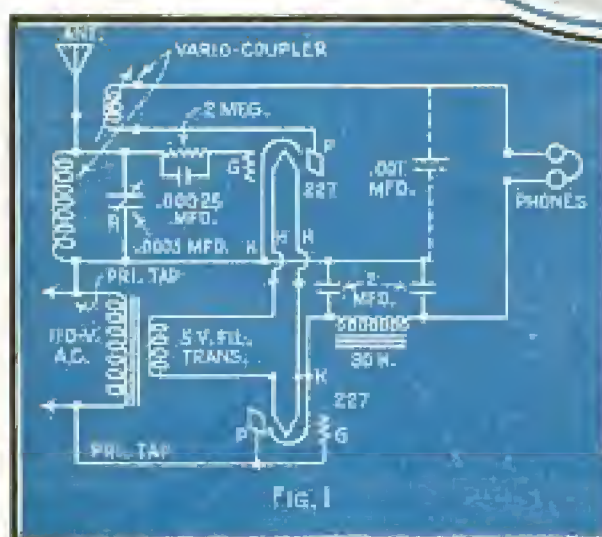
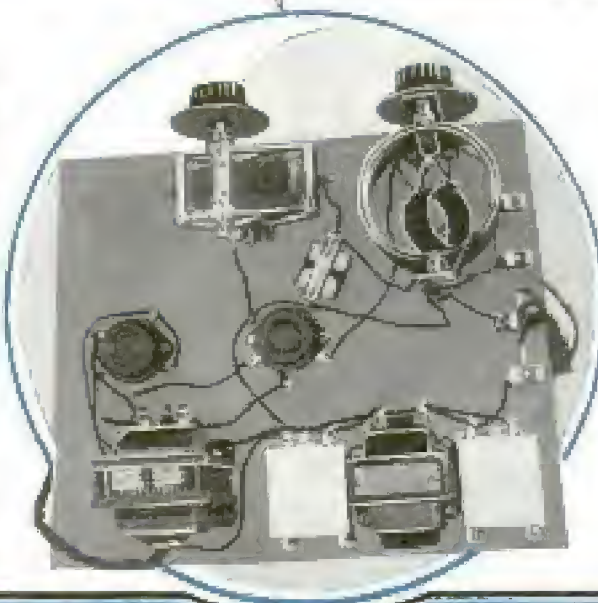
LOW-COST Is All-Electric

transformer specified. The latter, however, costs very little more and is advised. A suggestion for bringing the cost down would be to dismantle a junked receiver and salvage many of the necessary parts. The average radio shop has such receivers and would gladly part with them for little or nothing. Suitable parts will also be found in the chain stores.

The circuit shown in Fig. 1 is for use with a vario-coupler and a 5-volt filament supply. In this diagram, it will be noted that the filaments of the two type-27 tubes are connected in series to obtain the necessary 2½ volts for their operation. The

model shown in the photos was built and tested in Popular Mechanics radio laboratory and employs circuit Fig. 2. In this case a three-circuit tuner is used and the tube filaments are in parallel for a 2½-volt transformer. No difficulty was encountered in separating powerful local stations, and the re-

NO batteries or expensive parts are required to build and operate this two-tube a.c. receiver, and the cost will depend on the quality of these parts. The writer has built one of the sets for \$7, exclusive of tubes and phones, by substituting a 10-watt bell-ringing transformer for the filament



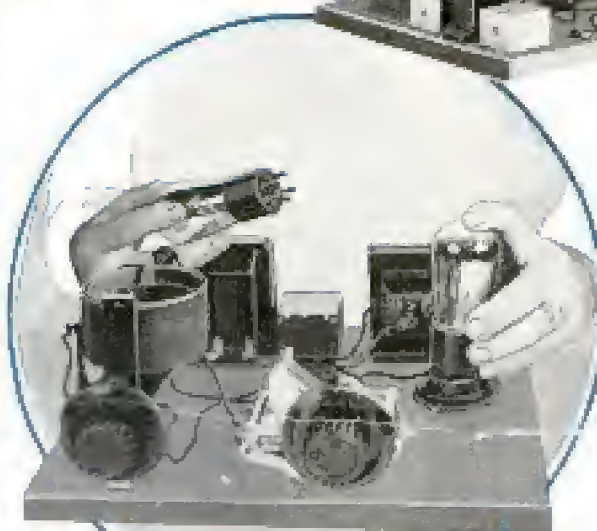
RECEIVER

By *Arthur B. Cooney*

sults were very satisfactory. In both circuits one tube has its plate and grid terminals connected at the socket, as it is employed as a rectifier, the other tube being the detector. Unmounted paper filter condensers, or cheap electrolytic ones, of either 2, 4 or 8 mfd. may be used. An old audio transformer with the primary and secondary windings connected in series usually has enough inductance to act as a filter choke. The parts are assembled as shown in the simplified wiring diagram on this page.

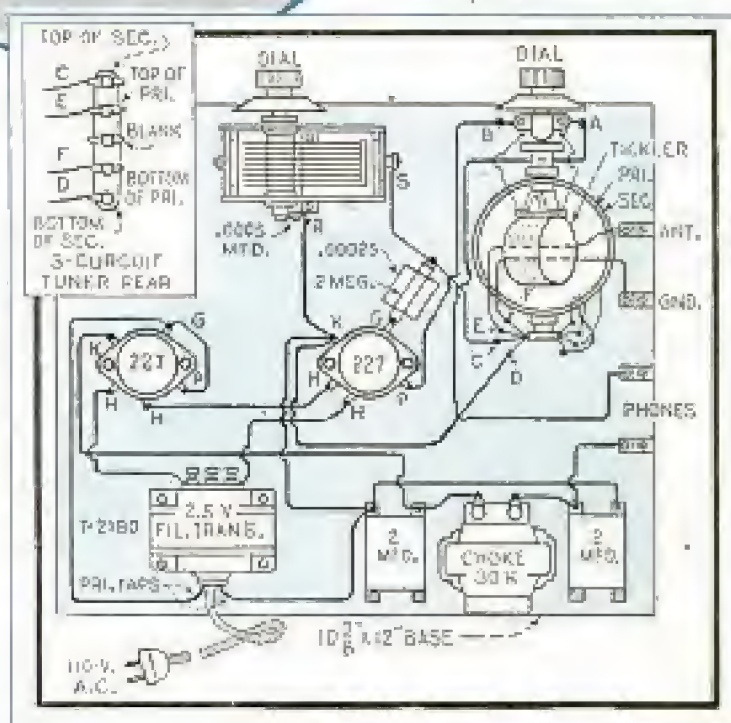
If the filament transformer used is housed in a case, it is necessary to remove the case so that the primary taps for the plate supply may be connected as shown. If a vario-coupler is used, as shown in Fig. 1, do not ground the antenna binding post or the house fuse will be blown. If built with the three-circuit tuner, care should also be taken that the light wires do not touch any part of the antenna circuit, or the result will be the same. If the terminals on your three-circuit tuner do not correspond with the lettered sketch, use the same identifying letters and trace out the windings. The large winding is the secondary; the primary has less turns and is located inside the secondary at one end. The rotating coil is the tickler. The grid-leak may be any value from 2 to 5 megohms. Material lists and enlarged diagrams are available.

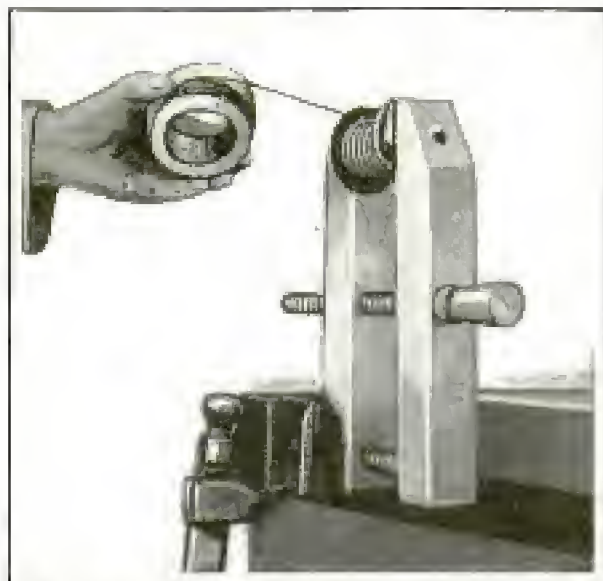
The set is tuned by slowly rotating the variable condenser and



adjusting the movable coil until the station comes in clear and with maximum volume.

An indoor antenna may be used for local stations but an outside type is required for distant reception.





Wooden Hand Clamp Showing Spool in Position

Spool Holder for Coil Winding

When winding coils, either by hand or in a drill chuck, it is necessary to provide some means for holding the spool of magnet wire. A simple method for bench workers is indicated in the photo. A hole is drilled through both jaws of a wooden hand clamp to take a piece of dowel rod for supporting the spool. The clamp is then placed in a vise and adjusted until the desired tension is secured. If the spool does not turn smoothly, or does not keep the wire taut, two large washers may be inserted between the jaws.

Inexpensive Ground Connections

Many long-distance broadcast-reception records are made with elaborate grounds, one record holder using as many as fifteen ground connections. A cold-water pipe is usually selected, and, if connected at a point before it reaches the meter, an excellent ground may be obtained. This may be supplemented with earth grounds made by driving iron rods or pipes into damp earth. In dry or sandy localities, it is often quite difficult to obtain a good ground connection. Some experimenters bury old leaky auto radiators and arrange a lead pipe and funnel for adding water to keep the ground damp. Old dry cells may be stripped of their cardboard covering and buried to provide a good ground. The red sealing wax in the top of each cell is broken away so that moisture may be absorbed by the chemical filler. A No.

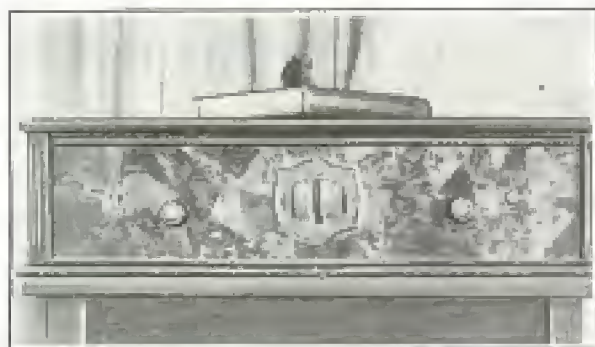
14 bare copper wire is soldered to the zinc casings, connecting all the cells together, and this lead is continued up to the ground post on the receiver.

Tube Base as Battery Connector

Circuit terminals for battery leads may be soldered to a four or five-prong tube socket for a separable plug-in connection. The socket is mounted at a convenient point on the rear of the chassis, near the audio end. The cabled leads from the batteries are then soldered to the prongs of an old tube base, to correspond to the socket contacts. This provides a quick means of connecting batteries and set.

New Uses for Old Panels

Old panel material need not be discarded because of numerous holes left from previous hookups. It may be decorated to cover the unused holes by pasting on small triangles of multi-colored tissue paper. The tissue may be cut into various shapes and sizes. If the design on the tissue is small and complicated, fairly large pieces may be used; otherwise it is best to make the pieces rather small. First remove any grease on the panel and apply the paste to the tissue. Bookbinders' paste will be found best. When completed, the panel should be allowed to dry for several hours, after which a thin coat of clear varnish or shellac may be applied. Small pieces of scrap panel material also can be cut into resistor mountings, insulating bushings and small unit panels for experimental breadboard layouts.



Completed Panel Showing Inlay Effect Obtained with Bits of Colored Tissue

For further information on any radio construction article write to the radio department; this service is free.

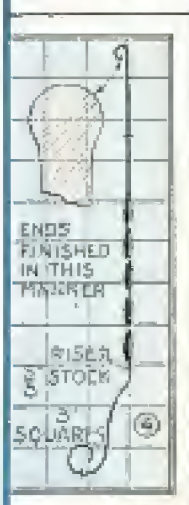
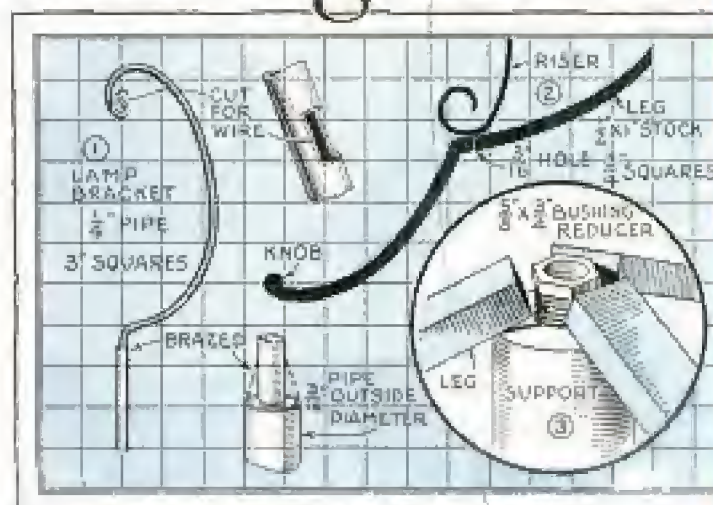
Swedish wrought iron-
 Swedish American Steel Corp
 429 Kent Ave

AMATEUR MECHANICS

Brooklyn
 ny.

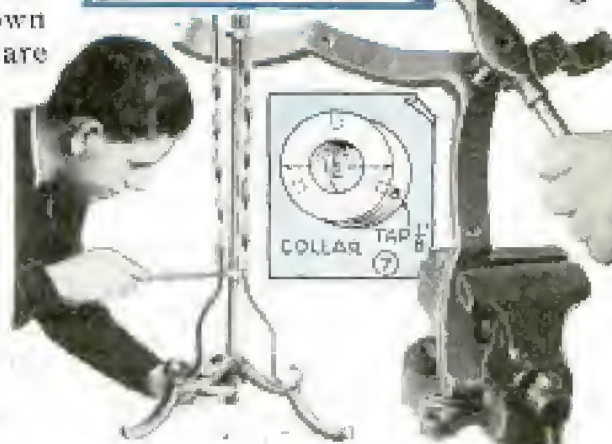
A HALL LAMP in Wrought Iron

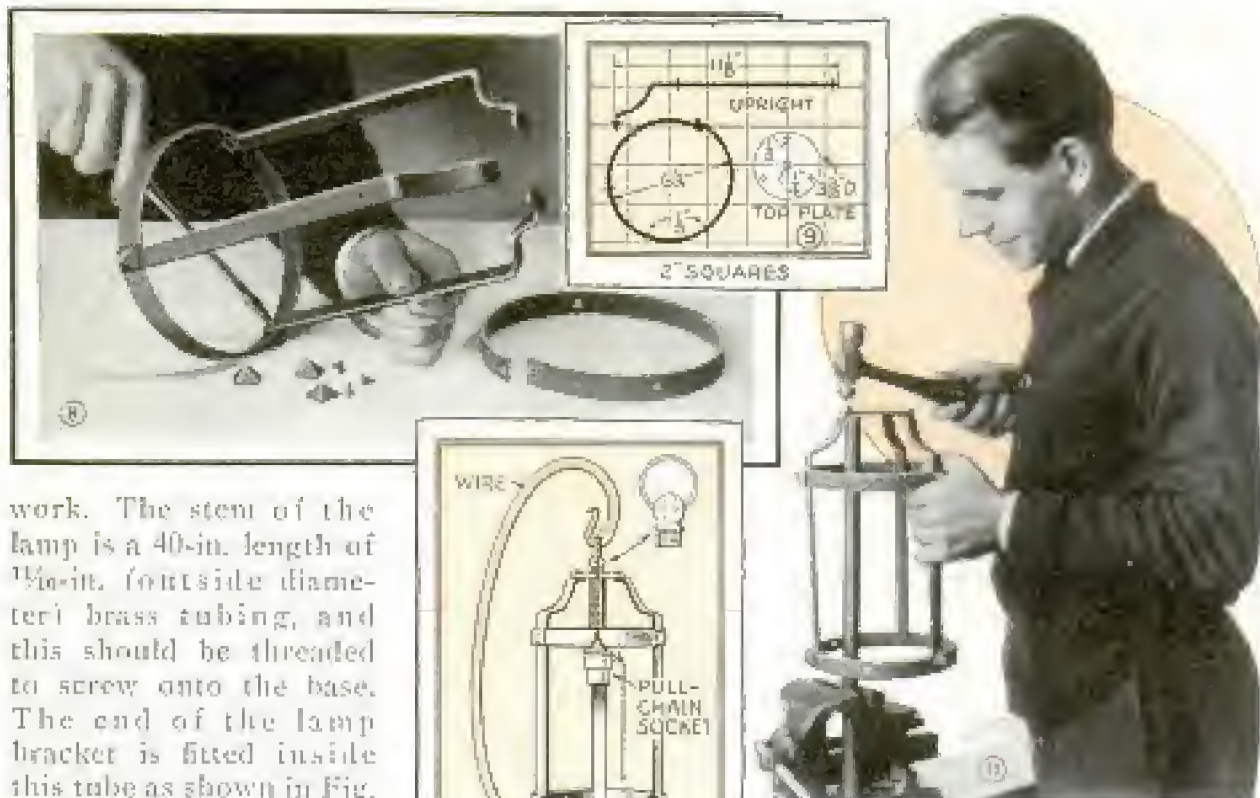
by
 Keenan
 H.
 Ward



FASHIONED from wrought iron and brass tubing, this attractive hall lamp should appeal to the home craftsman for its simplicity and practicability. With slight changes in the lamp and bracket, it will serve as a reading lamp, but in the form shown it is primarily for use in the hallway or corridor.

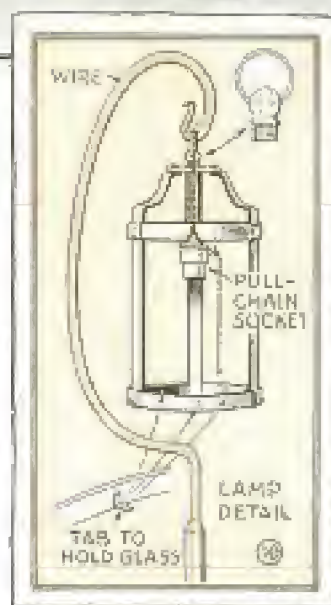
The first and most difficult step in the construction has to do with the making of the base. This is formed from three legs, fashioned from 1 by 1/2-in. iron to the shape shown in Fig. 2. The three legs, when finished, are properly spaced around a common bushing reducer, as in Fig. 3, and the assembly is brazed or welded together. Roughness on the work should be filed smooth, and the threads inside the reducer should be cleared of surplus metal by retapping, as shown in Fig. 6. This part of the job may be beyond the facilities of your own shop, but it is a simple and inexpensive matter to have the brazing or forging operations done by a workman equipped for this





work. The stem of the lamp is a 40-in. length of $1\frac{1}{2}$ -in. (outside diameter) brass tubing, and this should be threaded to screw onto the base. The end of the lamp bracket is fitted inside this tube as shown in Fig. 1. Notice that the bottom of this is a length of rather heavy pipe, of an exact size to fit snugly within the brass tubing to allow for adjustments in the height of the lamp from the floor. The lamp bracket proper is made from $\frac{1}{4}$ -in. pipe, the upper end being heated and drawn to a tapering point as shown. A small cut is let into the metal for the lamp cord. Fig. 4 shows the shape for the three risers which are made from $\frac{5}{8}$ -in. strap stock and drilled so that they can be fitted to the base, the screws being driven into a tapped collar as shown in Fig. 7. Small stove bolts may be used for fastening, or iron heads may be filed from a piece of square stock, as shown in Fig. 5, and tapped to take a $\frac{1}{8}$ -in. bolt shank. Iron work of any kind usually looks best with a hammered, natural finish. Small ball-peen-hammer marks can be used for the most, with a few indentations made with a planishing hammer. The hammering is best done before the metal is fitted to the desired shape, as any subsequent hammering would only tend to destroy the carefully bent design.

The lantern itself offers scope for a considerable variety of designs, but the one on this page is undoubtedly the easiest to make. Fig. 9 shows the necessary parts.



You will need three uprights, made from $\frac{5}{8}$ by $\frac{1}{2}$ -in. brass to the size and shape shown. The two rings are simply overlapped at the ends, the $\frac{1}{4}$ by $\frac{3}{16}$ -in. brass stock making the joint fairly compact. For the assembly, pyramid-shaped nuts are used on the bolts, the bolt heads fitting holes countersunk on the inside of the lantern, as shown in Fig. 8. The $\frac{1}{2}$ -in. brass top plate is riveted in place, as shown in Fig. 11, to complete the unit. Fig. 10 gives the details of the wiring. A standard pull-chain socket is used, and this is fitted to a short length of ornamental brass pipe which ties onto the ring nipple fitting through the top plate. The shade is a 6-in.-diameter colored-glass cylinder which is held in place by three small metal tabs (see Fig. 10).

The iron work preferably should have a natural finish. This is best done by the burning-off process. The parts are coated with linseed-oil varnish which is then burned off over a light fire. This should be repeated about three times to obtain the proper blackness. Then the highlights are brushed out with steel wool and file. Wax is lightly rubbed over the surface to protect the exposed portions. The brass is blackened by brushing with sodium sulphide, 1 oz. in 1 qt. of water.

Making Grotesque Enlargements of Pictures

Slotted lengthwise to make a sliding fit over the head of a thumbtack, as shown, an ordinary 12-in. rule or similar piece of wood can be used for making distorted enlargements of cartoons and photographs. The slot in the center should extend to $\frac{3}{8}$ in. from one end and about 1 in. from the other. A hole is then drilled through the latter to receive a pencil. A pointer, cut from thin sheet brass or tin, is fastened to the rule, to serve as a tracing guide as in a pantograph. Push a thumbtack, the head of which fits the slot in the rule, about halfway into a large flat board or table top and place the rule over this. The cartoon or picture to be distorted and a large sheet of white paper are laid to the right of the tack, both being held in place with thumbtacks. Insert the pencil in the hole

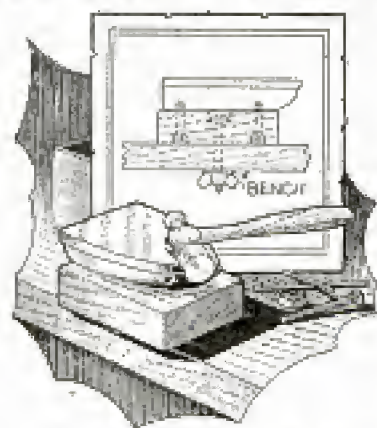


With This Slotted Rule and a Pencil, You Can Make Distorted Enlargements of Cartoons or Photos

in the rule, and follow the outlines of the cartoon with the tracing point, raising the pencil whenever a line is finished. It is not necessary to watch the pencil or the large sheet of paper. When all the lines have been traced, a distorted picture of the original will appear on the large sheet of paper.—H. R. Wallin, Brooklyn, N. Y.

Detachable Anvil Made from Flatiron

An ordinary flatiron is utilized to make this detachable anvil. The iron is drilled and tapped for two bolts, inserted through



countersunk holes drilled in a hardwood base, which in turn is attached to the bench by means of a bolt and wingnut as shown in the detail.—W. C. Wilhite, Hornsby, Ill.

Hints on Laying Linoleum

Linoleum can be handled much more easily if it is exposed to the sun or artificially warmed to make it pliable before it is put down. In order to prevent buckling, which is caused by expansion when the edge of the linoleum is tacked to the floor, remove the molding along the base-

board, and let the linoleum extend to within $\frac{1}{8}$ in. of the wall. Then replace the molding and nail it to the baseboard instead of the floor, which allows the edges to be held down without binding. The floor should be surfaced before the linoleum is laid, as a rough floor greatly shortens its life. When it is pieced together, tack down the seam at 3-in. intervals with brass escutcheon nails.

Attaching Window Shade to Roller to Prevent Tearing

To prevent a window shade from being torn from its roller, cut the end of the shade at two points, forming three equal sections. Fasten the center section to one side of the roller and the two end sections to the other side as shown, tacking the edge down in the usual manner.





Hinged Panel with Folding Footrest Forms Disappearing Shoe-Shining Stand

Shoe-Shining Stand Folds into Wall

Here is a shoe-shining stand that swings out of the way when not in use. A footrest is hinged on the inside of the panel and is held in position by a folding bracket. Both the rest and the bracket fold down flat against the panel, which is hinged to the baseboard. A shelf for the polish and brush is provided on the inside.

Dissolving Crystals and Other Solid Chemicals



When making solutions of crystals and solid chemicals, sediment of undissolved matter can be prevented by simply wrapping the crystals in small pieces of cambric or muslin. Small cloth bags are useful for this purpose. Where considerable stirring is necessary, the bag may be dropped in and

agitated by means of a spoon or rod, but if the chemical dissolves easily, the bag can be hung from a short stick laid over the mouth of the bottle.—Jos. M. Creamer, Astoria, N. Y.

How to Prevent Small Concrete Pools from Breakage by Freezing

If a few small logs or boards are thrown into a small concrete pool, so that they float on top of the water, the freezing of the water will not crack the sides of the pool. The expansion of the ice causes the boards to rise out of the water, thus relieving the pressure against the sides. For small pools, pieces of 2 by 4-in. stock, or even a few lengths of flooring, will do as well as short logs.

Rubber Mat on Top of Stepladder Holds Small Tools

You will find a small corrugated-rubber mat nailed to the top of a stepladder useful to prevent small tools and parts from falling off. Narrow strips of inner tube can be nailed under the outer edges of the mat, to form a "tray." Such a mat also reduces the risk of slipping when standing on top of the ladder.



Making Leather Faucet Washers

Water-faucet washers that are pliable and will last longer than the ordinary kind, can be cut from good belting or harness leather. Then they should be dipped in melted paraffin for two or three minutes to waterproof them, being careful not to burn the leather by having the paraffin too hot. These washers allow the water to be shut off with little pressure on the faucet, thus eliminating the possibility of grooving them, which causes leaks.

☛ Woolen blankets will dry quicker if they are hung in a breeze dripping wet.

MAKING Your Own SKIS



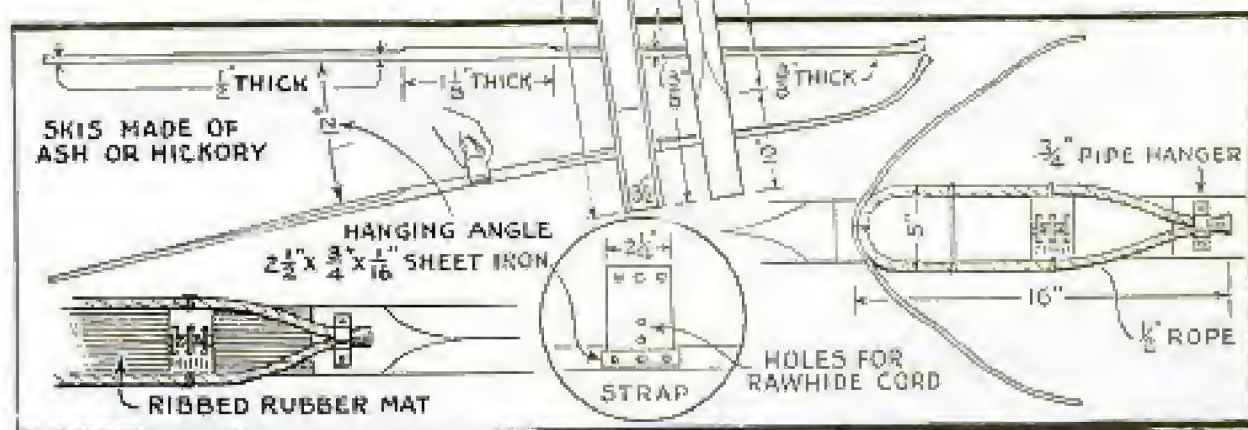
By
R. M. Roland

Courtesy
Armstrong Roberts

WITH a little care and patience, it is comparatively easy to make a pair of skis. Get two 8-ft. lengths of select well-seasoned $1\frac{1}{2}$ -in. ash or hickory. Plane the top down from $1\frac{1}{2}$ in. at the center to $\frac{1}{2}$ in. at the rear and $\frac{3}{8}$ in. at the front, leaving a 12-in. flat section at the center. Then round off the tips as indicated. The underside of each ski is to be grooved, starting 6 in. from the tip and running the entire length of the ski. This can be

done with a dado head, or by running the saw through the stock several times, setting the ripping fence back about $\frac{1}{8}$ in. for each successive cut. A single groove should be $\frac{1}{2}$ in. wide, but if two grooves are used, they should be $\frac{1}{4}$ in. wide and should be spaced 1 in. apart. The grooves should be $\frac{7}{16}$ in. deep; a single groove is centered and the two grooves spaced equidistantly from the edges.

After the grooves have been cut, the edges are planed down so that the width is $3\frac{3}{8}$ in. at the front, $3\frac{1}{4}$ in. at the center, and





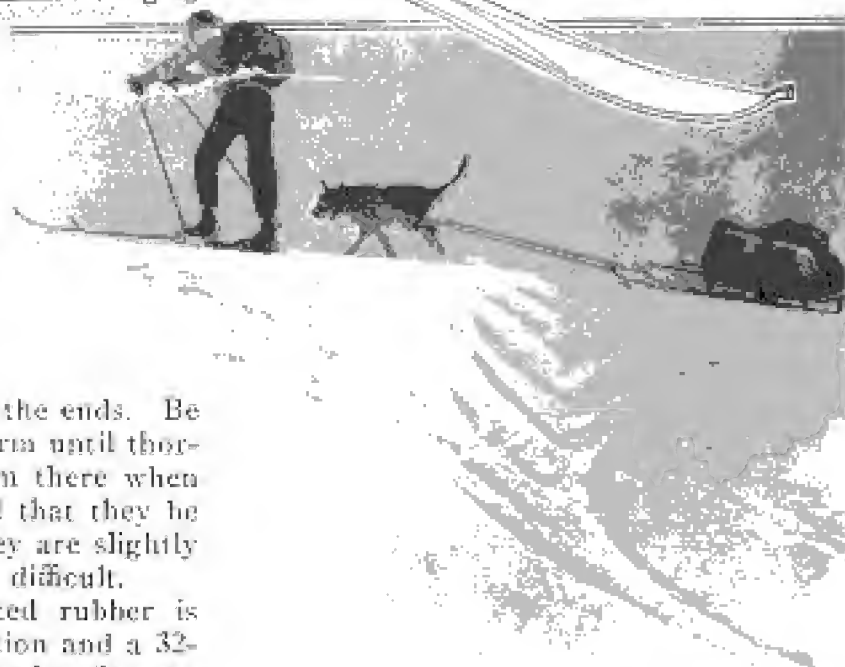
Racing with the Wind down a Long Hill on Skis, Is One of the Most Thrilling Winter Sports

3½ in. at the rear end. Beveling the tops is next, after which the tips are held in boiling water and the skis placed in a bending form as shown on this page. Note that the center of the skis is slightly raised above the ends. Be sure to leave them in the form until thoroughly dry. Also keep them there when not in use, as it is essential that they be kept perfectly flat, for if they are slightly twisted, skiing will be quite difficult.

Next, a pad of corrugated rubber is glued to the flat center portion and a 32-in. length of ½-in. rope, looped to fit your shoe, is fastened to the ski by means of a pipe hanger. The ends of the rope should be wrapped with strong cord or picture wire to prevent them from unraveling. The toe strap is then attached. It consists of two pieces of leather with eyelets

for lacing, and is attached to the edge of the ski by means of two strips of ½-in. flat iron, drilled to receive screws. A rawhide crosspiece is tied across the rope loop, just in front of the heel, two other lengths of rawhide are tied to the rear end of the loop to come over the instep, and the rope is fastened to the straps with rawhide cord. When the ski is held at the toe strap, it should incline about 12° toward the rear, such balance being accomplished by careful beveling. Also be sure that each ski is well balanced crosswise. After the skis have been finished, they are carefully gone over with a fine grade of sandpaper and then given a coat of shellac or spar varnish, followed with wax, which is brought to a high polish. However, if you desire, the skis may be given a coat of lacquer or paint, possibly in two colors, and then waxed.

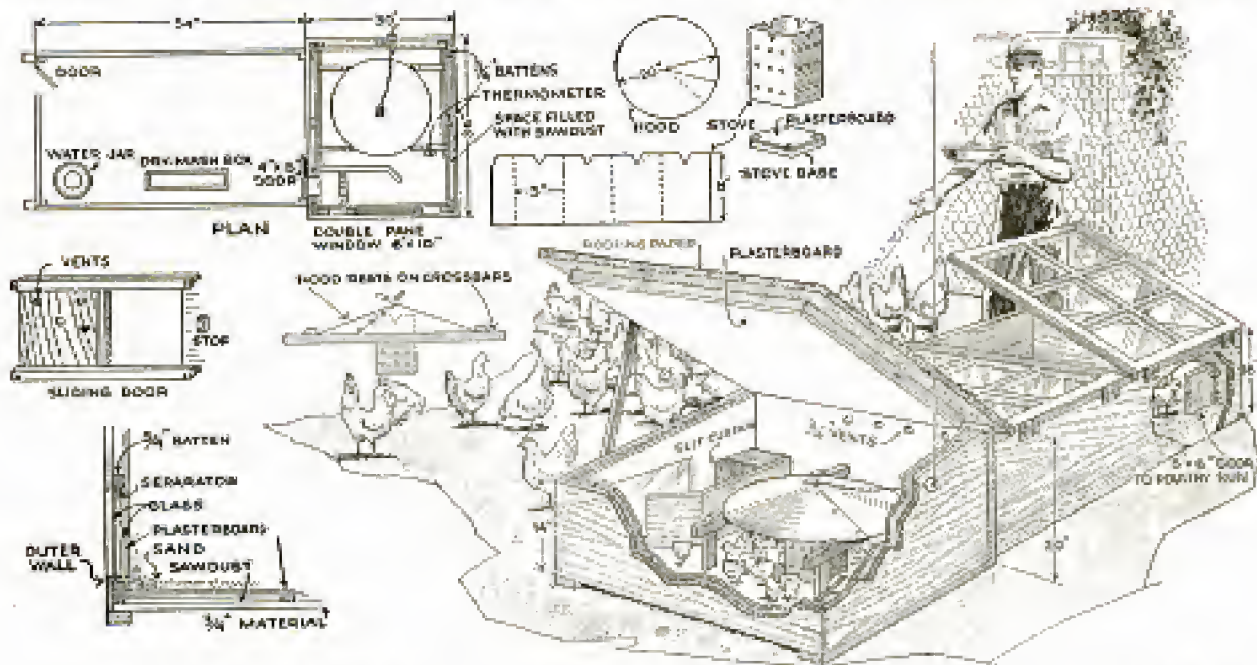
You should also have a pair of ski sticks. These can readily be made from 4-ft. lengths of stout bamboo with a small baby-carriage wheel, from which the hub has been removed, securely wired to each stick, about 6 in. from one end. The bottom of



Courtesy Armstrong Roberts

each stick is then provided with an iron spike, imbedded in rosin, while a leather loop to fit your wrist, is attached to the other end, the loop being large enough, so that you can free your hands easily.

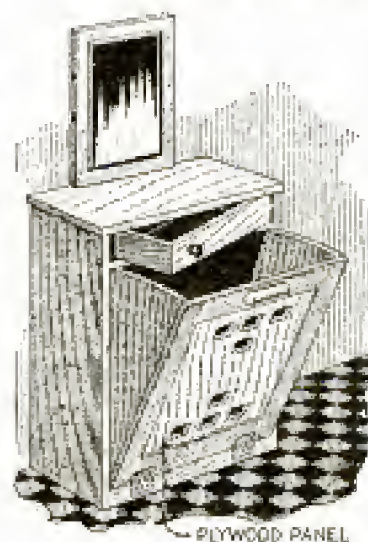
This Warm Brooder Develops Sturdy Chicks



Two years' experience has proved this brooder highly efficient. The double-wall construction provides warmth in the coldest weather. Matched lumber is the best material for the outer walls, although ordinary $\frac{3}{4}$ -in. boards will serve. Build the inner wall and floor of plasterboard over battens, so there will be a space between them to be filled with dry sawdust. Lay waterproof roofing paper on the floor, which is to be covered with dry, sifted sand. A double-pane window is necessary in cold sections, but in milder climates a single pane will do. Build a wall, about 8 in. high, at the door end to avoid drafts. A piece of flannel, with a number of vertical slits, hung at the doorway, retards the inrush of cold air. No severe draft is possible, however, as all air must come in from the glass-roofed inclosure, which is kept closed on cold nights. The stove and hood are made from light galvanized sheet iron and an electric lamp is placed inside. The hood rests on crossbars and can be lifted for inspection and for changing lamps. The temperature should be maintained at 85 to 90° the first two weeks, and gradually diminished until the chicks are six or eight weeks old. Start with a 60-watt lamp and work down to one of 25 watts. On winter nights, the sliding door, detailed on the left, is closed. This does not prevent circulation as the fresh air comes in through the holes in the door

while the foul air goes out through the vents near the roof. Props should be made to hold up the roof and also the glass frames that form the top of the "sun room," when it is necessary to open either compartment.

Combination Dresser and Clothes Hamper for Bathroom



Fitted with a swinging drawer for small articles and a ventilated bin, this clothes hamper takes little space in your bathroom. The drawer is hinged at one corner, while the clothes bin is hinged at the bottom and has a plywood panel in which

small holes are cut for ventilation. With the addition of a mirror above the hamper, it will serve satisfactorily as a dresser.

☛ A piece cut from a canvas tool kit or rubber mat will serve as a blowout patch if you leave the tire partly inflated.



Coping Saw Equipped with Two Blades Assures Equidistant Spacing of Cuts When Sawing Scrolls

Two-Blade Coping Saw Makes Parallel Cuts

By fitting a coping saw with two blades, two equidistant cuts can be made in one operation, which is especially helpful when cutting scrolls. When using two blades in this way, it will, of course, be necessary to arrange them so that the teeth face the side of the saw frame, in which notches are cut for attachment of the extra blade as shown.

Films, Pinned to Float, Are Kept Clean in Wash

When washing films without a standard tank, the amateur photographer often experiences difficulty in having particles adhere to them. By pinning the negatives to the edge of a piece of cork or wood,



about 6 by 8 in. in size, they can be floated in a basin as shown without coming in contact with the bottom. Glass-head thumb-tacks should be used for

this purpose, as the long heads act as buffers to prevent the negatives from scraping against the sides of the basin.—Charles B. Barr, Stratford, Conn.

Pat. no. 1,764,864
 Dr. Arthur F. Jungerhille.
 Shampoo Bottle Handy for Pouring
 Small Amount of Liquid

If you have ever spilled liquids when trying to pour just a few drops from a bottle, you will appreciate the use of a shampoo or hair-tonic bottle that allows only a few drops to be shaken out at a time. Such a bottle needs no cap to prevent excessive evaporation, and should it be accidentally tipped over, not more than a drop or two of the liquid will be lost.—Warren F. Robinson, New Bedford, Mass.

Holes in Bucket Rim Save Paint

Punched in the rim of a paint bucket, a number of small holes allow paint to run back into it. If carefully made, the holes will not prevent the lid from properly sealing the can against the entrance of air, which, of course, soon would cause the paint to dry out. Another advantage of this method of draining off the paint that collects on the rim, is that it will not run over on the outside of the bucket.



Fireproof Container for Valuable Papers Made of Pipe

A fireproof container for valuable papers can be made as follows: Thread both ends of a 15-in. length of 2-in. pipe to take caps. Put a $\frac{3}{8}$ -in. layer of asbestos inside each cap and seal it with a snug-fitting disk of sheet brass. Then place an equal length of 1-in. brass pipe inside of the iron pipe, concentrically, which is done by inserting three strips of wood between the two pipes. Pack the space between the pipes with asbestos, remove the wooden strips and pack the space left with asbestos. Papers rolled and placed in the inner pipe will be safe from fire when the caps are fitted on tightly.

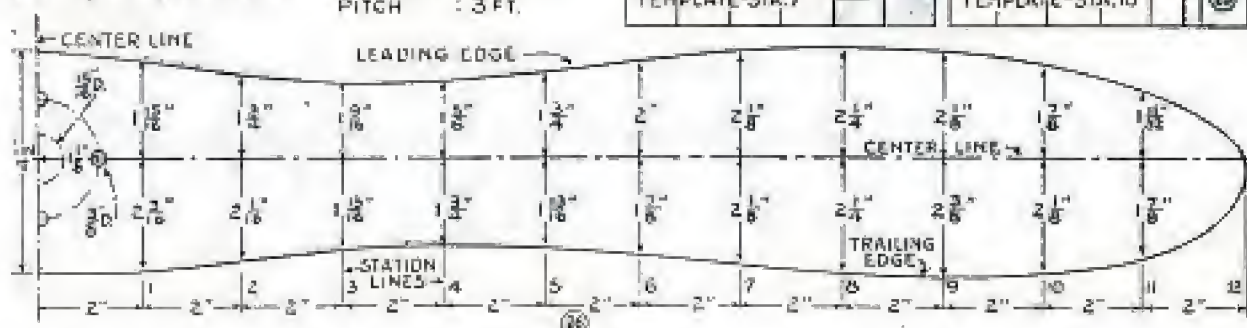
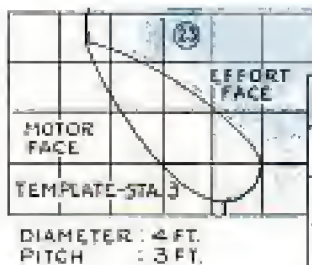
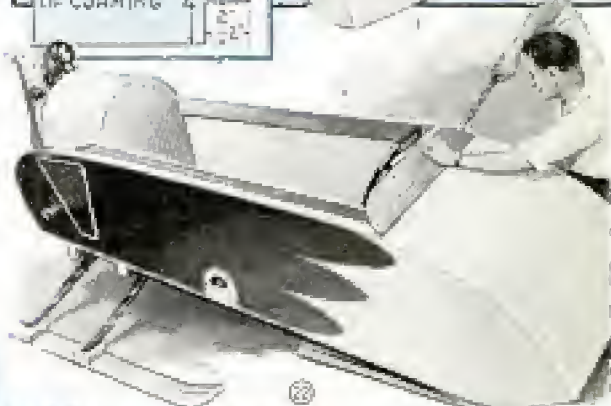
☛ Tri-sodium phosphate mixed with water makes a good wash for removing paint from the hands.

Build this Ice Speedster

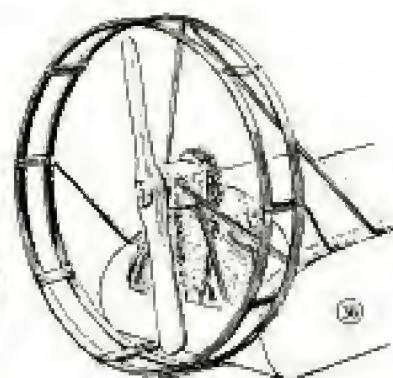
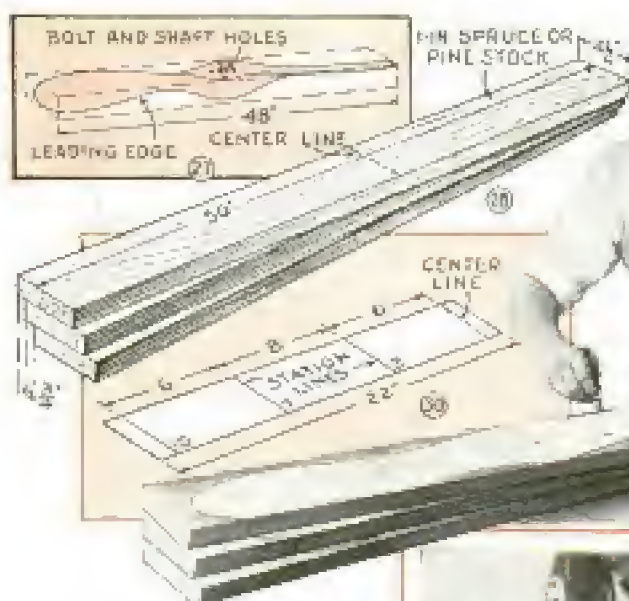
PART TWO

WITH the framework, motor mount and skis of the ice speedster finished, the completion of the body becomes comparatively simple. Next comes the application of the side and forward deck coverings. These should be cut from a good grade of plywood or from wood-fiber composition board. The exact shape is easily found by temporarily nailing a slab of the material into place and penciling around it. Galvanized nails will do for the fastenings, as shown in Fig. 20. Note that the right side covering is cut out at the rear to form a wedge-shaped door which affords entrance to the motor, and that a semicircular cut is made about midway for a step. The paint job shown in the pictures can be easily duplicated and is very effective in green and white or blue and white. Galvanized iron, painted to match the wood covering, is used to partly close in the motor.

The woodwork around the cockpit comprises five pieces, two of which, the round-topped seat back and the dash, are probably already in place. The next two to be fitted are the coaming strips, which extend along each side of the opening. These are made from $\frac{3}{8}$ -in. stock, 4 in. wide. Fig. 21 shows how the forward end of the coaming on either side is cut to allow the wind plate to be screwed into position, as in Fig. 22. This piece, like the



A Speed of 30 Miles on Snow and 60 Miles on Ice Is Attained by This Ice Speedster Which Is Fitted with a 4-Fl. Air Propeller Driven by a Twin-Cylinder Motorcycle Engine

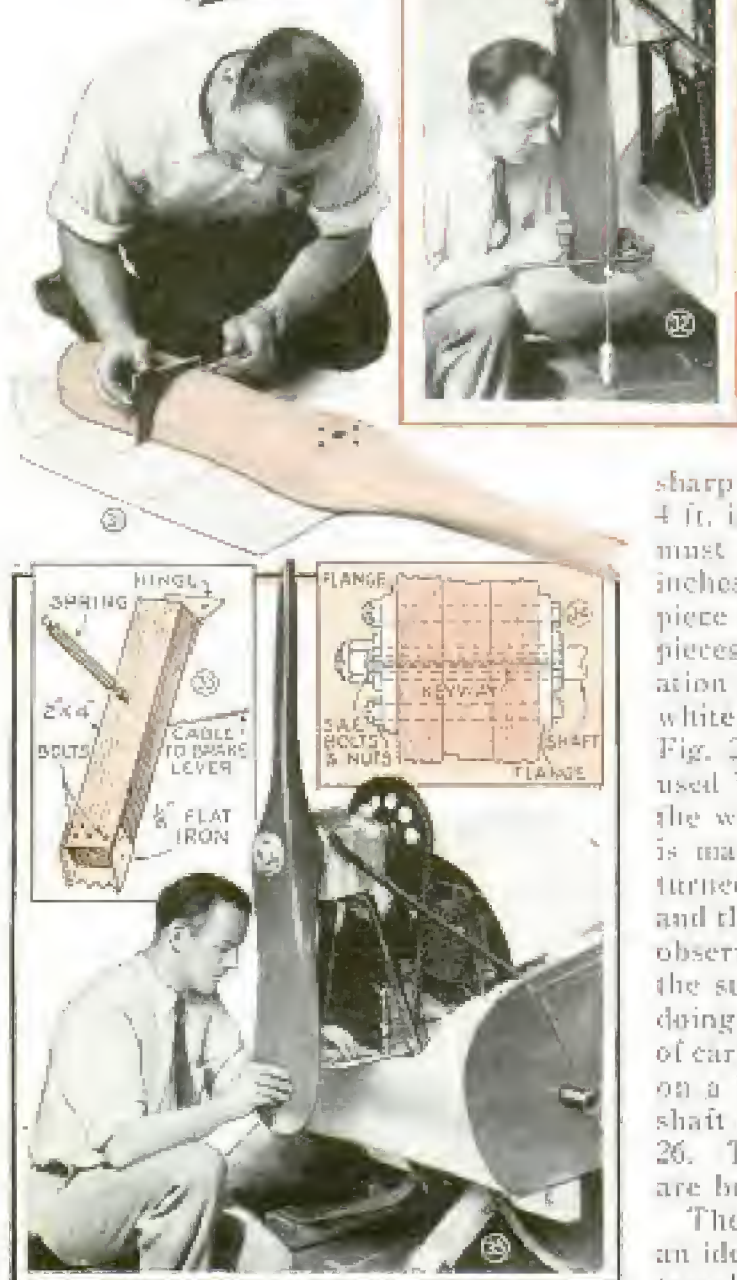


coamings, is from $\frac{1}{8}$ -in. stock, beveled on the underside to fit the deck, and rounded and curved along the top to show a pleasing contour. Round-head wood screws are used to fasten the woodwork. All raw edges formed by the joining of sides and deck should be finished before painting.

Now for the propeller. While you will undoubtedly get a better product by purchasing it, good results can be obtained with the homemade wheel shown in the illustration. First make cardboard patterns similar to those shown in Figs. 23 to 26 inclusive. These should be carefully laid out full size, and then cut to shape with sharp scissors.

As the propeller is to be 4 ft. in diameter (Fig. 27), the wood used must be at least that length or a few inches over. This is not to be in one solid piece but is built up from three 1-in. pieces, which are glued together with aviation glue as in Fig. 28. Spruce or good white pine is satisfactory and easy to work. Fig. 29 shows how the paper pattern is used in laying out the propeller shape on the wood surface. One-half of the blade is marked at a time, then the pattern is turned over, adjusted to the center lines, and the opposite side penciled in. You will observe that the pattern extends beyond the surface of the uppermost board, thus doing away with some of the hard work of carving. After cutting the slab to shape on a bandsaw, it is advisable to drill the shaft and bolt holes as indicated in Fig. 26. These should be perfectly true, and are best done on a drillpress.

Then comes the carving. Fig. 27 gives an idea of what edges to start on, and the templates can be used as a constant check



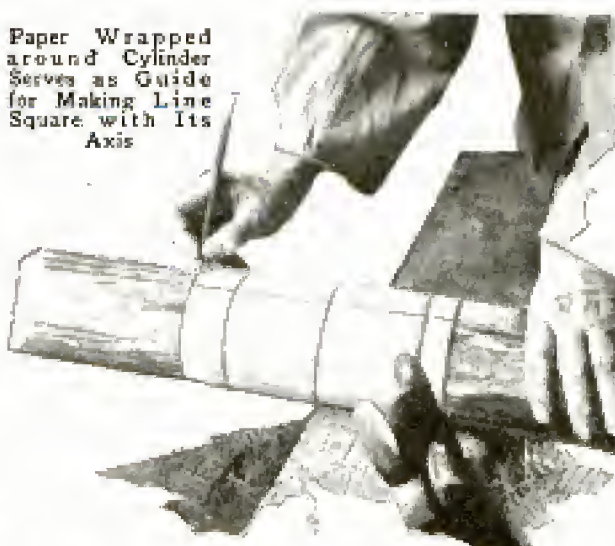
as you approach the finished shape. Besides the templates, you will need a length of cardboard with the three station marks and the center line set off on it, as in Fig. 30. This is placed under the propeller, center line at the hub hole (see Fig. 31) as a guide in placing the templates at the proper position.

The method of fastening the propeller to the motor shaft is shown in Fig. 34. A 4½-in. pipe flange is fitted to either side of the hub and held in place with bolts. These should have an S.A.E. standard thread. Each flange is properly cut to take the key, as indicated in the shaft drawing Fig. 9 of Part I. There are three important factors in the propeller construction, two of which are common to all air screws. First of all, the propeller must balance exactly, that is, one side cannot be heavier than the other. The application of stain and hot linseed-oil coats should not be done until the balance is perfect; after that the propeller should be touched up with sandpaper not coarser than the No. 0 grade. The propeller is not set to drive straight ahead but is inclined 2° to the rear to exert a slight upward pull necessary to offset the weight of the motor at the rear. Check with a plumb bob, as in Fig. 32. The 2° inclination of the propeller amounts to about 1 in. when projected the half-length of the blade. Finally, the blade must "track," that is, it should check perfectly to a point set out from the framework at either blade tip, as shown in Fig. 35. In all three factors of balance, angle and track, it is advisable to correct inaccuracies by recarving and shimming at the hub.

A substantial guard, made of pipe or heavy bar iron, should be mounted, as shown in Fig. 36, to prevent danger of injury from the propeller. The parts of the guard are welded together for strength, and suitable braces are used to hold it rigidly in position.

For a brake you will make up the simple arrangement shown in Fig. 33. This is hinged to one of the rear-spring supports and is operated by means of a cable connecting to a rod within convenient reach of the driver. Seating accommodations for the pilot and one passenger are provided by standard folding seats used on all coach-model cars.

Paper Wrapped around Cylinder Serves as Guide for Making Line Square with Its Axis



Paper Guide for Making Straight Line around Cylinder

For making a straight line around a cylinder, at right angles to its axis, a piece of paper with a straight edge can be used as a guide. Wrap the paper so the overlapping edges form an unbroken line, then follow this around the cylinder with a pencil.—Charles A. King, East Kingston, New Hampshire.

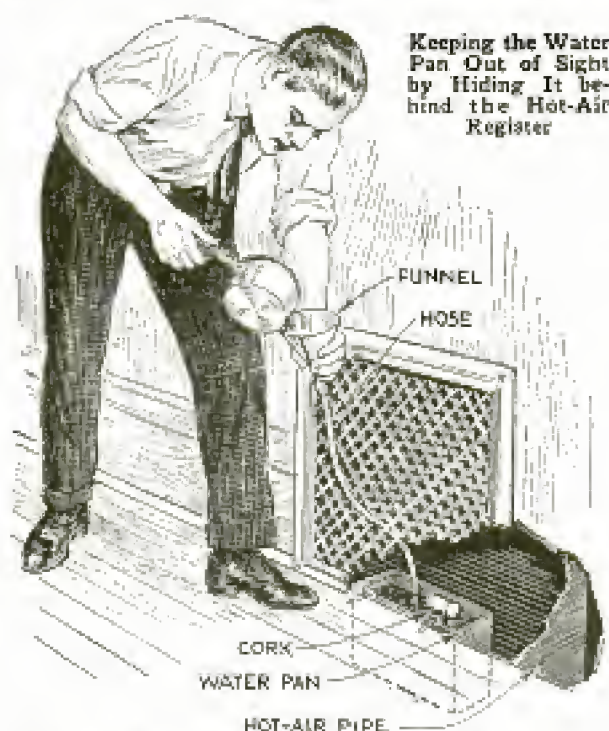
Cuff on Worker's Trouser Serves as Nail Pocket

Where a worker must assume a bending position, as when nailing flooring, a 2 or 3-in. cuff turned up on the trouser leg provides a good pocket for the nails as



it keeps them within easy reach. It is, of course, advisable to sew the cuffs in this position permanently, and it will be found convenient to form several narrow pockets instead of two or three wide ones so that the nails will be held vertical

and thus readily can be taken out. The height of the pockets should be less than the length of the nails.



Water Pan in Hot-Air Pipe Maintains Proper Humidity

In order to maintain the proper humidity in a room that is heated by a hot-air furnace, a water pan can be placed in the pipe behind a wall register and nailed to the floor as indicated. The pan is filled with water by means of a funnel and a length of rubber hose. A similar method can be adapted to a floor register by suspending the pan from the register grating. —Harry C. Jackson, Chicago.

Clothes Kept from Freezing to Line with Paraffin

Wet clothes hung outside in cold weather often freeze to the line, especially if it is of the woven-cable type, which may result in some of the more delicate garments being torn when removing them. To avoid this, draw a piece of softened paraffin wax back and forth on the line so that it becomes covered with a water-proof film, which will last indefinitely.

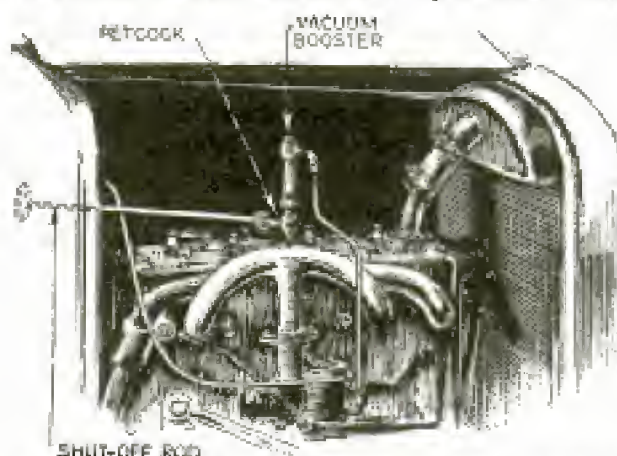
Platinum Deposit on Glass Provides Base for Soldering

By depositing a coat of platinum on glass or porcelain, it can be soldered to metal. Crush dry platinum chloride, 1 gram, to a fine powder, and mix in enough oil of lavender to form a thin paste. Dur-

ing this process, keep the mixture on ice to prevent it from reducing and let it remain there for at least two hours. Then add oil of rosemary to obtain the desired consistency. A good solution is formed by adding enough of this oil to increase the bulk of the paste about ten times. The mixture may be brushed on the glass, or small parts can be dipped into it. After the paste has been applied, heat the glass over a Bunsen flame for a few seconds and the metallic coating will form, the coated parts turning to a bright silver color. The higher the temperature of the glass, the better the coating will adhere. Solder takes readily to this coating and cannot be removed without chipping the glass. When soldering glass to metals, it is necessary to remember that their expansion is unequal, and, therefore, the metal parts should be thin enough to bend and conform to the size of the glass at different temperatures.—H. E. Overacker, Palo Alto, Calif.

Booster Supplies Rich Mixture to Start Cold Car

Mounted on the intake manifold at its highest point, a booster taken from an old vacuum tank can be used to supply a rich fuel mixture for easier starting of a car during cold weather. A petcock, which holds the booster, is fitted to the intake manifold, and a dash control is provided for operating the cock, which is only opened for starting. The gasoline supply for the booster is taken from the float chamber of the carburetor by means of a



Booster Forces Rich Mixture into Intake Manifold for Starting Car in Cold Weather

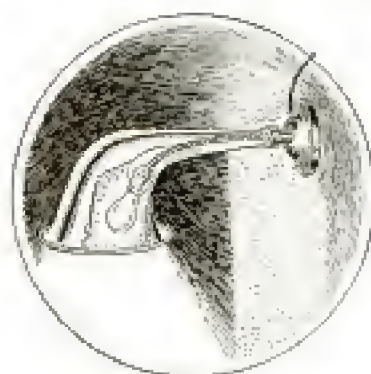
copper tubing, attached as shown. Closing the hand throttle and opening the pet-

cock will supply a finely atomized mixture into the manifold when the engine is cranked.—A. H. Vance, Bensenville, Ill.

How to Make "High-Key" Photos

Any amateur photographer who does his own finishing can make "high-key" prints, that is, without dense shadows. Dilute the regular developing solution with an equal amount of water, and add 1 oz. of hypo fixing bath. First develop a test strip of film that has been given a short exposure. If a suitable image does not appear within 3 or 4 minutes, increase the exposure. If the image becomes too dark and dense, add more hypo until the picture comes up in delicate tones. A developing time of 5 minutes is usually required for such pictures. As the developer loses its strength rapidly, it is a good idea to observe its effect constantly. When made on fairly rough paper, these photos somewhat resemble sketches or etchings.

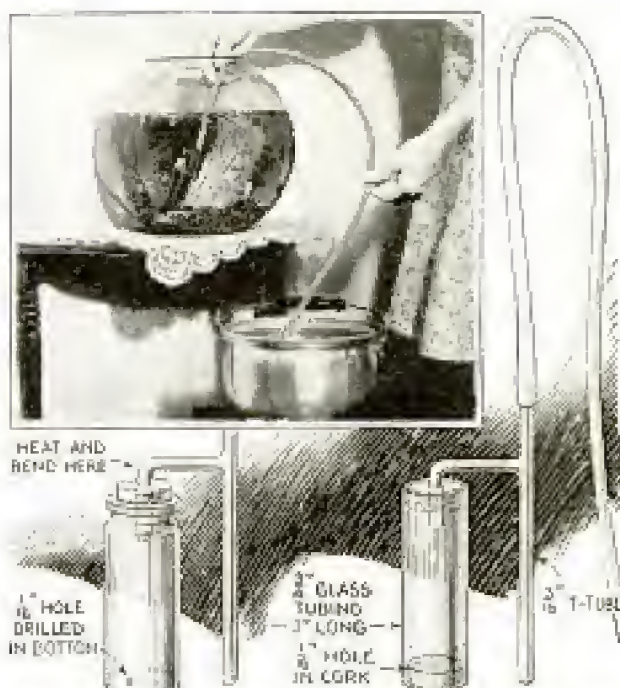
Radio Horn Serves as Reflector



the neck of the speaker and an extension cord is run through the plug so that the lamp will be held in the position shown.

Siphon for Aquarium Is Self-Starting

You can easily make a self-starting siphon for draining your aquarium. Get a glass tee and bend one end as shown. Take a 3-in. length of $\frac{3}{4}$ -in. glass tubing and fit corks in each end, a $\frac{1}{16}$ -in. hole being drilled through one cork, while the other is drilled to receive the bent end of the smaller tubing. If desired, a bottle or test tube of suitable size can be used instead of the larger tubing by drilling a $\frac{1}{16}$ -in. hole in the bottom of it, as shown in the left-hand detail. A length of rub-

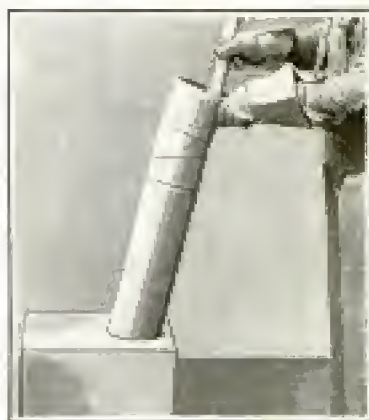


Automatic Siphon Made of Glass Tubing and Rubber Hose Quickly Drains Small Aquarium

ber tubing slipped over the upper end of the glass tee completes the job. The siphon is plunged into the water, which rushes through the small hole at the bottom and displaces the air in the chamber, forcing it up through the rubber tubing. The buoyancy of this air carries the water with it, and when the air is out of the chamber, the water continues to flow in a steady stream.

Box Catches Soot When Cleaning Stovepipe

By inserting the end of a section of stovepipe into a hole in a cardboard box as shown, you can prevent the soot from being blown around when cleaning the pipe. The box should be tightly closed. By tapping or scraping the inside of the pipe with a stick, the soot will fall into the box.



Coloring, added to paint after the final thinning, causes it to be streaky.

Making the TENDER for the

By Reginald H. Claudius



PART III

AFTER completing the locomotive, the tender is a comparatively simple job. First the wheel rims are sawed from $1\frac{3}{4}$ -in. outside diameter brass tubing with $\frac{1}{8}$ -in. wall, allowing $\frac{1}{16}$ in. for finish on each rim. The flange is formed by turning down the tread to $1\frac{3}{4}$ in. in diameter and $\frac{5}{16}$ in. width as in Fig. 48, leaving $\frac{1}{16}$ in. for the flange, the face side of which should meet the tread at a small angle. The top edge is rounded slightly when taking off the final finish cut, and the edges are brought to within $\frac{1}{16}$ in. of the required finish dimension. The hubs are cut from $\frac{1}{4}$ -in. brass rod and are rough-faced, allowing approximately $\frac{1}{16}$ in. on each end for finish. The hubs are not drilled until the wheels are fully assembled.

The wheels are made on a jig cut from $1\frac{1}{2}$ -in. hard maple or aluminum, about 4 in. square. It is faced in the lathe to leave a center projection $1\frac{1}{2}$ in. in diameter and $\frac{1}{8}$ in. high, as in Fig. 48, which is slotted $\frac{1}{16}$ in. deep for twelve spokes cut from No. 22-gauge brass. Care must be taken to have the slots equally spaced, and

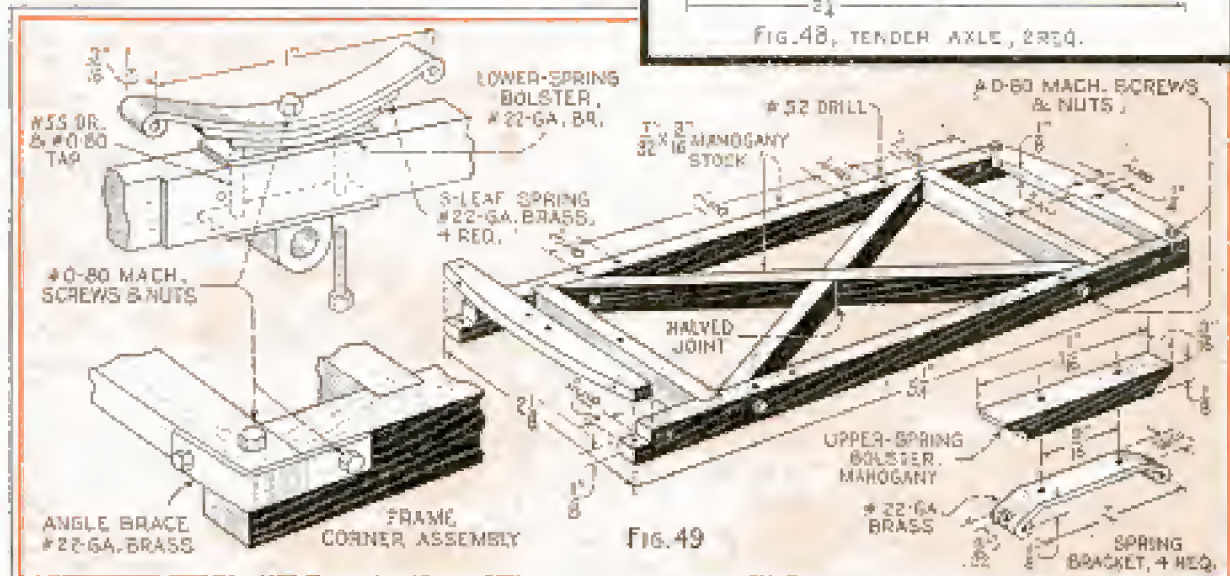
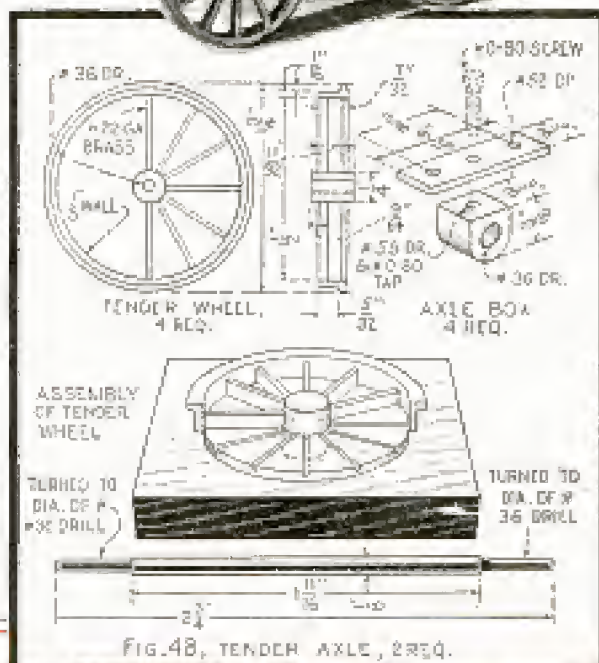
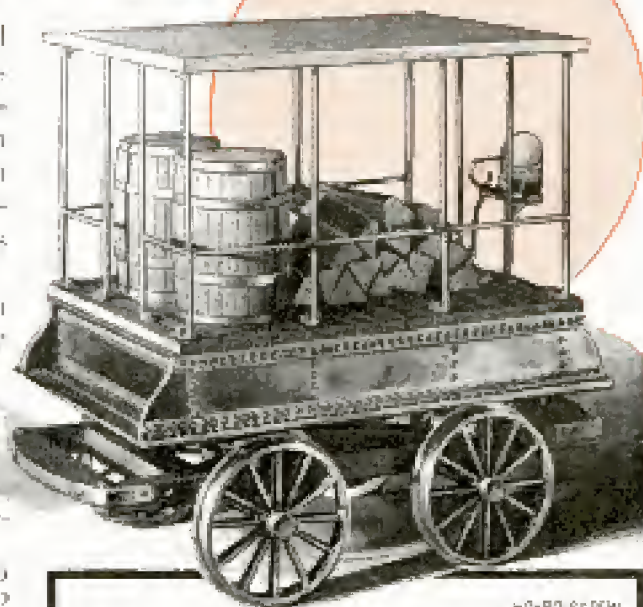
they are sawed to the same depth. It is necessary to select a blade that will cut a slot the same width as the thickness of No. 22-gauge brass, so that the spokes will be held in the proper position when the wheel is assembled for soldering. A $\frac{1}{4}$ -in. hole is bored in the exact center of the jig to an exact depth of $\frac{1}{4}$ in. The hub should be a snug fit in the hole to prevent tipping. The spokes are made by cutting a long strip from No. 22-gauge brass to a width of $\frac{3}{16}$ in. Then the strip is held in the vise and draw-filed to a width of $\frac{1}{8}$ in. The spokes are cut from the strip to a length slightly greater than that required, and are inserted in the slots with the inner ends bearing tightly against the hub. The outer ends are filed down lightly until the rim will slip snugly over, after which the spokes are soldered to both rim and hub. Excess solder is removed with a fine file, the rim is finished to $\frac{5}{16}$ -in. width, and the outer end of the hub is faced, leaving the inner end until you are ready to assemble the wheels and axles on the frame.

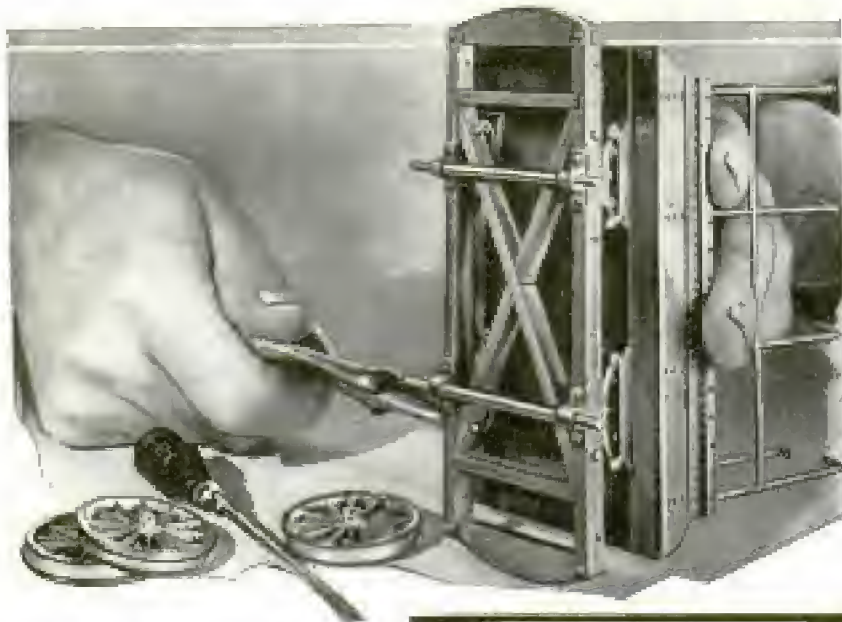
Four axle boxes are made as shown in Fig. 48. The top plate of each box is of No. 22-gauge brass, and the box proper is filed from $\frac{3}{16}$ -in. stock, to the shape and size shown. Slight allowances are made for filing to finish dimensions after the box is assembled. For greater accuracy in assembling, the axle box may be held to the plate with a No. 0-80 screw as indicated, the head of the screw being filed

DE WITT CLINTON *Train*

off after soldering. The boxes are finished by filing lightly, and a No. 36 hole is drilled through the center of each, as indicated. The axles are then turned from $\frac{1}{8}$ -in. brass rod to the dimensions given in the lower detail of Fig. 48. A slight allowance is made on the shouldered ends to insure a free-running fit in the boxes.

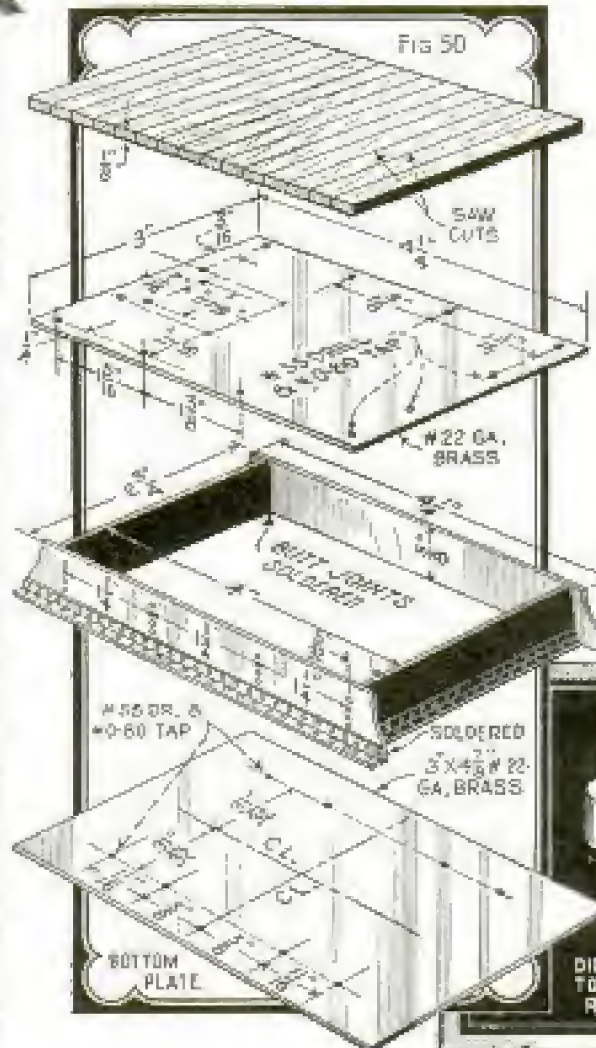
Malogany is used for the frame, as in Fig. 49, the parts being joined together with No. 0-80 screws and nuts. All holes in the frame are drilled with a No. 52 drill. The three-leaf springs and spring brackets are made as shown. The leaves of the spring are cut from No. 22-gauge brass and are soldered together at the center to hold them in position for drilling a No. 52 hole at the center. Before assembling, the eye at each end of each spring is filed down to a width of $\frac{3}{16}$ in. so that it will fit the notch in the bracket. The lower spring holster is cut from No. 22-gauge brass to the same size as the axle-box plate, and it is drilled and tapped for three No. 0-80 screws, two of which hold the axle box, and one the spring, as in the upper left-hand detail of Fig. 49. The boxes must be placed on the axles before bolting to the frame, and care must be taken when drawing up the bolts to see that the axles do not bind. Owing to the difficulty of drilling the small holes accurately in the wood, it is possible that one or more





of the boxes will be slightly out of line when the bolts are drawn up. In this case it will be necessary to run a larger drill through one hole so that the box may be brought in line.

Fig. 50 shows the construction of the water tank. With the exception of the angle strips, which are made of No. 26-gauge brass, all metal parts are No. 22 gauge. After the bottom plate has been cut to size, holes are drilled and tapped as indicated, including two No. 42 holes, $\frac{5}{8}$ in. from a center line drawn lengthwise and $\frac{3}{8}$ in. from the forward end. The latter holes take the feed pipes leading to the hand and power pumps on the locomotive, and the exact location is of no particular importance. The sides and ends of the tank are then cut, the rivet impressions are made as indicated, and the assembly is soldered, care being taken to flow the solder evenly into the butt joints. The angles are formed from strips of No. 26-gauge brass,

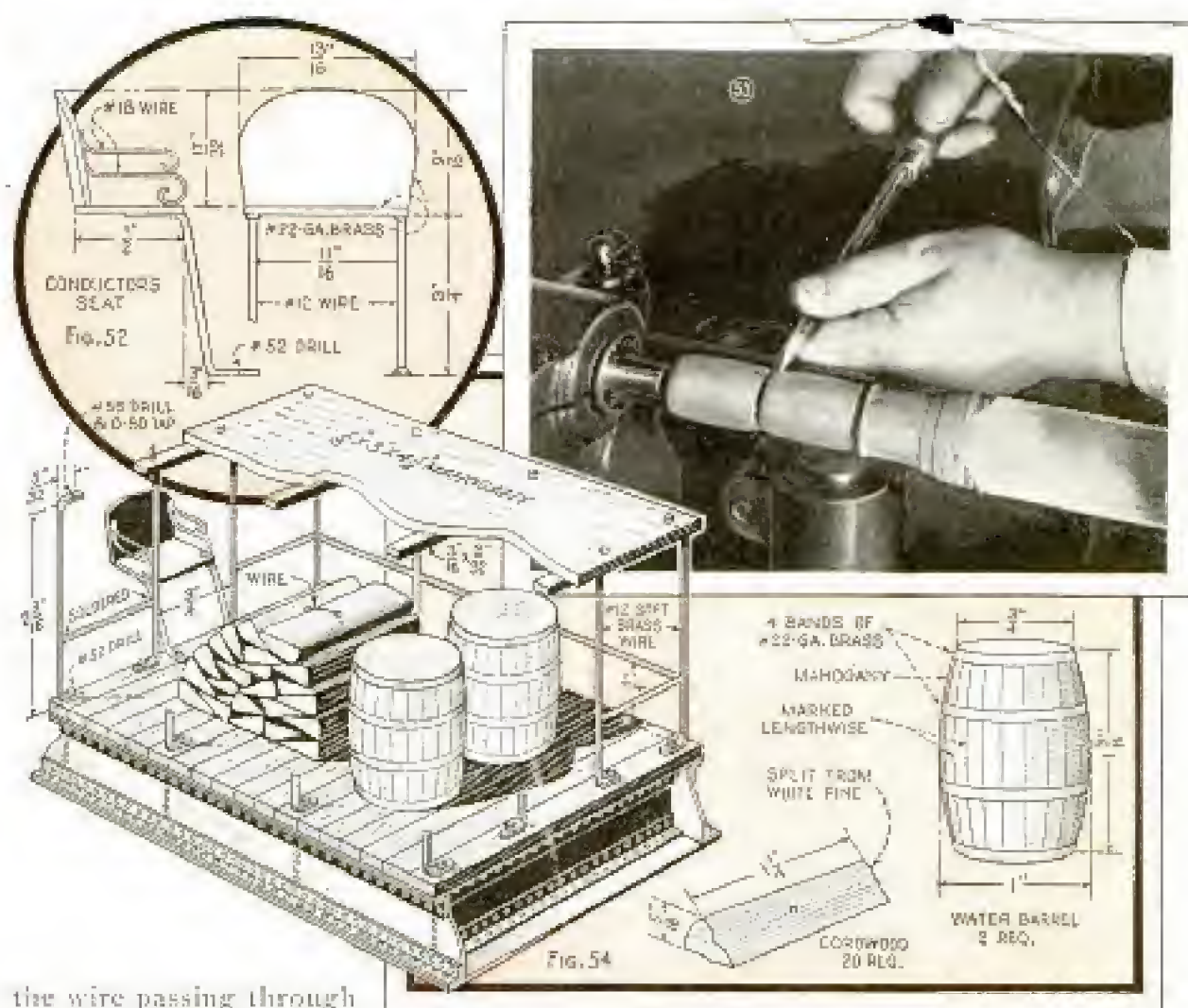


cut $\frac{1}{4}$ in. wide and bent at right angles along a center line drawn lengthwise. The rivet-impression die is altered to punch the rivets as in Fig. 51. The two lines of rivets are staggered. Angle strips are soldered at both top and bottom of the ends and sides of the tank. Only the lower angles are shown in Fig. 50.

After the top plate has been drilled and tapped, it is used as a jig in laying out the No. 52 holes to be drilled through the wood platform, which is made of $\frac{1}{8}$ in. mahogany, the same size as the top plate. The grain should run crosswise, and the original planking is simulated by light saw cuts on the top and edges, as shown in Fig. 56. Before bolting the platform in place, about twenty pieces of cordwood are split from straight-grained white pine, to the approximate size given



in Fig. 54. A small hole is drilled through the center of each of twelve pieces and these are strung on a length of fine wire. Two small holes are then drilled through the wood platform near the rear end and along a center line to take the free ends of

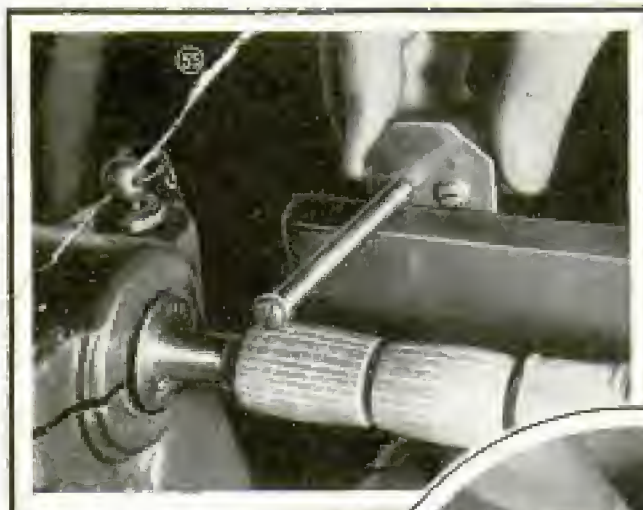


the wire passing through the cordwood, the ends of the wire being bent on the underside of the platform to hold the wood pile in place. The top pieces of wood are arranged so that the wire is as little exposed as possible.

Next, make the stanchions supporting the top from No. 12-gauge wire to the dimensions of Fig. 54, and flatten, drill and tap the ends as indicated. Place the deck in position, then bolt the stanchions or uprights in place with No. 0-80 screws turned into the tapped holes in the top plate of the tank, the screws passing through the deck as in Fig. 54. Solder a railing to the uprights $\frac{3}{4}$ in. above the deck, leaving the ends open between the two center uprights as shown. Make and attach the conductor's seat as shown in Figs. 52 and 54. Turn two water barrels from mahogany, as in Figs. 53 and 54, and mark the barrels lengthwise with a marking gauge, as in Fig. 55, to represent the staves. Four $\frac{3}{16}$ -in. bands, cut from No. 22 or 26-gauge brass, are made and fitted

to each barrel as shown. Center a No. 55 hole in the bottom of each barrel, cut the heads from two No. 0-80 screws, and turn these up half the length of the thread in each hole. Then drill two No. 55 holes in the wood platform, insert the projecting end of the screw and turn down each barrel until tight. The holes in the platform are drilled in such a position that the barrels will be located approximately as in Fig. 54. The exact location is of no importance.

The top is supported on crosspieces $\frac{3}{8}$ in. in size, and both top and crosspieces are held by No. 0-80 screws, turned into the tapped holes in the upper ends of the stanchions. The thickness of the top is given as $\frac{1}{4}$ in. but $\frac{3}{8}$ -in. material may be used. Bolt the upper bolsters and spring brackets to the bottom of the tank as in Fig. 57, and bolt the two crosspieces in place with No. 0-80 screws, which are turned into the wood through the bolster. Set the tank on the running gear, fit the



springs to the brackets, run fine wire through the eyes in both spring and bracket, and place a drop of solder on each end of the pins to hold them in place. Level the tank by bending the springs and brackets slightly if necessary. Allow only about $\frac{1}{16}$ in. clearance between the bottom of the tender tank and the wheel flange. Make couplings from No. 22-gauge spring brass as in Fig. 58. The eye is simply a short length of No. 18-gauge wire bent to the U-shape approximately $\frac{1}{16}$ in. high and soldered to the plate which is bolted to the front and rear crossmembers. The No. 0-80 screws holding the plate are turned up from underneath into tapped holes in the plate and the projecting ends of the screws are filed flush. The spring is slotted to fit over the eye thus formed.

Lastly, the wheel hubs are drilled with a No. 36 drill and the wheels are placed on the axles in a trial fit to determine the amount of stock to be removed from the inner face of the hubs, allowing just sufficient clearance between the rim and frame to insure that the gauge is correct. Take the necessary waste off the inner ends of the hubs and sweat the wheels to the axles. In doing this, be very careful to allow sufficient play so that the wheels will turn freely without binding. File the projecting ends of the axles flush with the

hubs. As the wheels are built up on a wooden jig, it is possible that slight inaccuracies may occur in the finished wheel, making it necessary to depart somewhat from the dimensions given in Fig. 48 when fitting the wheels to the axles. The gauge is of the greatest importance and, within reasonable limits, it is permissible to alter the dimensions of the hub to insure the necessary clearance of the rim and the correct gauge.

The next, and probably last, installment of the article covering the construction of the De Witt Clinton train, which is to appear in the April issue of Popular Mechanics, will show the details and assembly of the coaches. After



TENDER-TANK
BOTTOM
FIG. 57

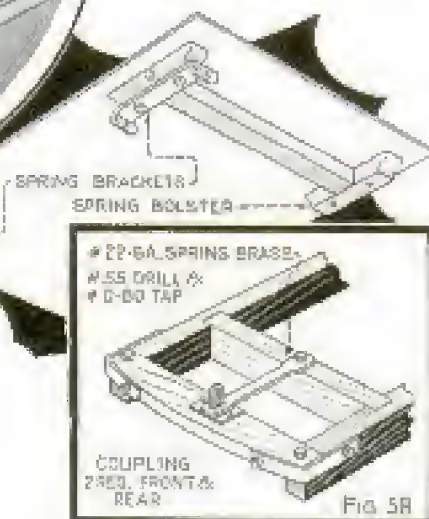


FIG. 58

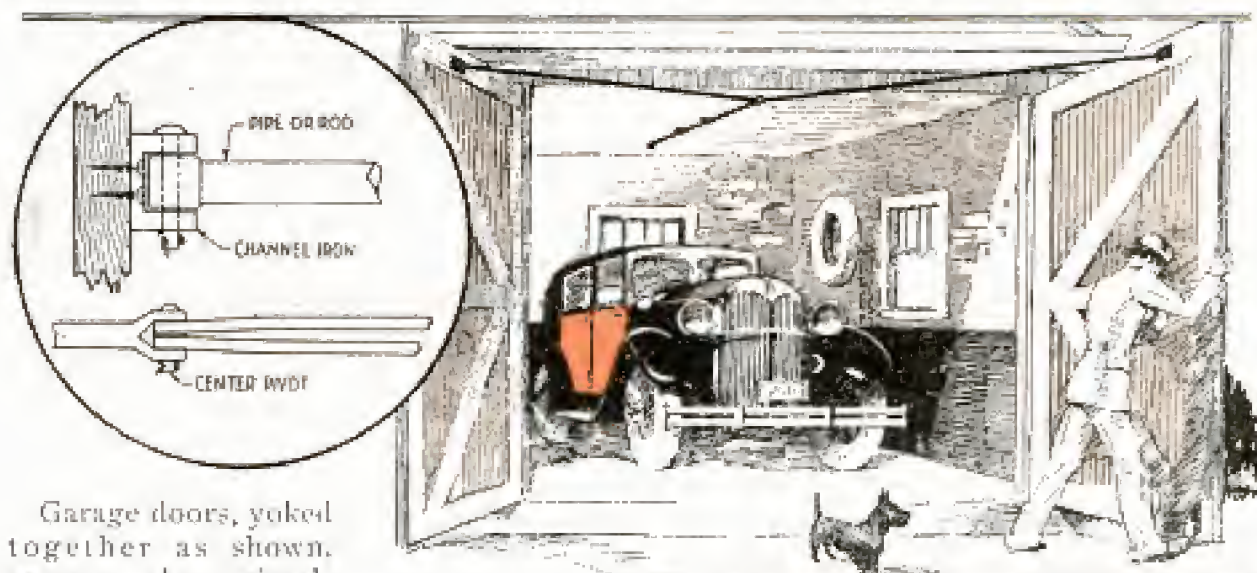
this, full information will be given on the painting and lettering.

De Witt Clinton Prize Contest

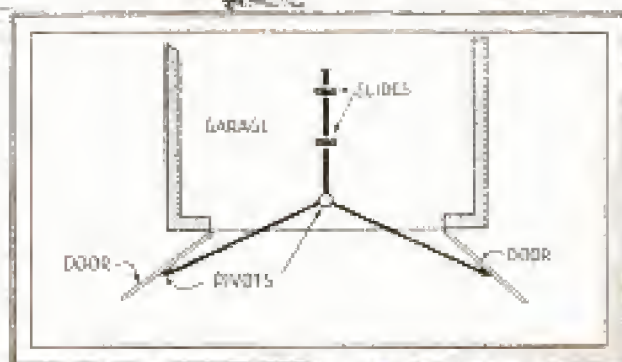
Prizes totaling \$2,500 in cash and free trips to New York, will be awarded by Popular Mechanics Magazine to those who build the best models of this train. Contest closes Dec. 31, 1932. For more information, write to S. N. Dept., De Witt Clinton Contest, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

If you cannot purchase No. 0-80 screws, write to Popular Mechanics, and we will furnish them at cost. Blueprints on the De Witt Clinton model are also available.

Garage Doors Yoked Together Open Quickly



Garage doors, yoked together as shown, open or close simultaneously, saving many steps. Another advantage is that the wind cannot blow one door shut without exerting enough pressure to move both of them, and as it blows against the outside of one and the inside of the other, the pressure is equalized. Two slides are fastened to garage joists, or blocks of wood nailed to the joists, to accommodate a rod or pipe pivoted to two similar lengths which are attached to the top crosspiece of the doors. The slides must allow the rod to move back and forth easily, and a little grease applied at these points helps to reduce friction. The length of the sliding rod depends on the size of the doors and their swing, and also on the length of the cross rods, while the loca-

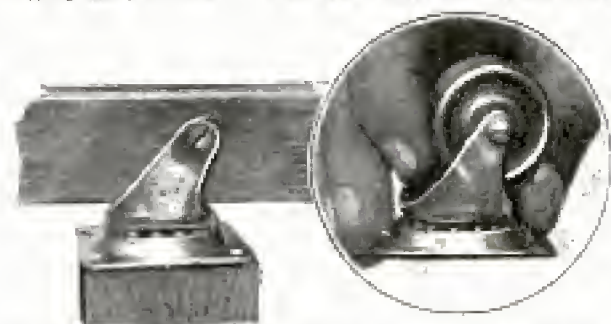


tion and spacing of the slides is determined by the distance that the rod moves back and forth. All three rods are flattened at the ends and pivoted together. Similarly, the cross rods are pivoted to the doors, the pivots being shown on the left-hand detail.—J. E. Hyler, Peoria, Ill.

Caster Makes Bearing for Windvane

Castors of the ball-bearing type make good bearings for homemade weather-vanes. Remove the roller and attach the vane as shown in the left detail. The ball

bearing has very little friction so that the vane will register the slightest change in the air currents. As it is constantly exposed to all kinds of weather, the bearing should be kept well greased to avoid rust.

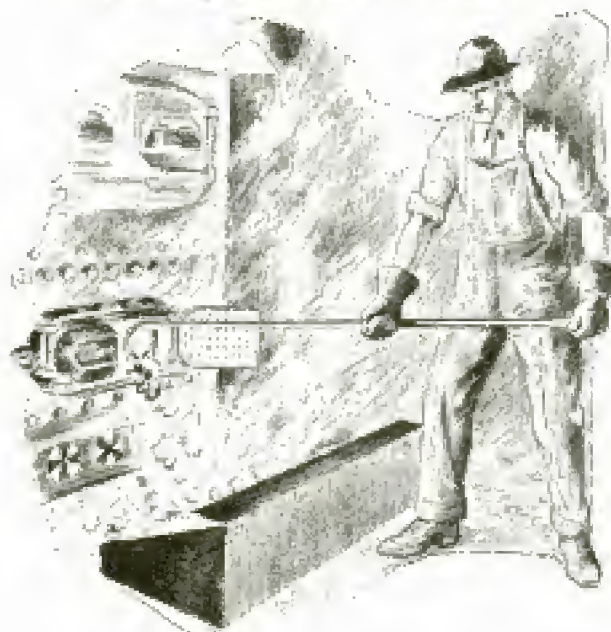


Ball-Bearing Furniture Caster Provides Frictionless Pivot for the Weathervane

Rubber Mat in Sink Saves Dishes

To offset the risk of breaking dishes when washing them in the sink, it is a good idea to cover the bottom of the sink with a rubber pad or mat. Old auto mats, which are worn out in spots may be cut to shape and used for this purpose, or corrugated rubber can be purchased in any desired size. A hole is cut through the rubber to fit over the sink drain.

Metal Guard Prevents Hot Clinkers Burning Shoes and Trousers



Sheet-Metal Guard Prevents Hot Clinkers from Scattering over Floor When Cleaning Furnace

Firemen and janitors will appreciate this clinker guard. It is a piece of heavy sheet metal shaped as shown, and is placed on the floor in front of the furnace to keep hot clinkers from scattering over the floor when pulled out of the furnace.

Bottle Caps and Covers Removed with Strong Cord



When you have a bottle cap or tight cover to remove and no opener is at hand, try the following trick: If the bottle is fitted with a screw cap, loop a strong cord around it as shown in the left-hand detail, and pull the cord as indicated. In the case of a crimped cap, loop the cord around the bottle neck just below the edge of the cap and pull up on the cord. The use of a small block placed on the cap will increase the leverage, and

if cord is apt to be cut on the edge of the cap, a length of wire may be substituted. —Paul L. Ambelang, Chicago.

How to Keep Photographic Solutions

Photographic solutions can be kept for several weeks without losing much of their strength, if they are kept in bottles fitted with air-tight caps or covers. After putting the solution in the bottle, heat it slowly until it is as hot as you can hold in your hand and screw on the cover. Heat expands the air over the solution and forces out some of it. If the bottles are immediately capped securely after heating, they will contain less air, upon cooling, than otherwise, and the solution consequently absorbs less air, with the result that it will last much longer. This method is useful for the amateur who has prints to develop every day or so, but not if only occasional work is done.

Rubber Bands Hold Chisel to Wrist

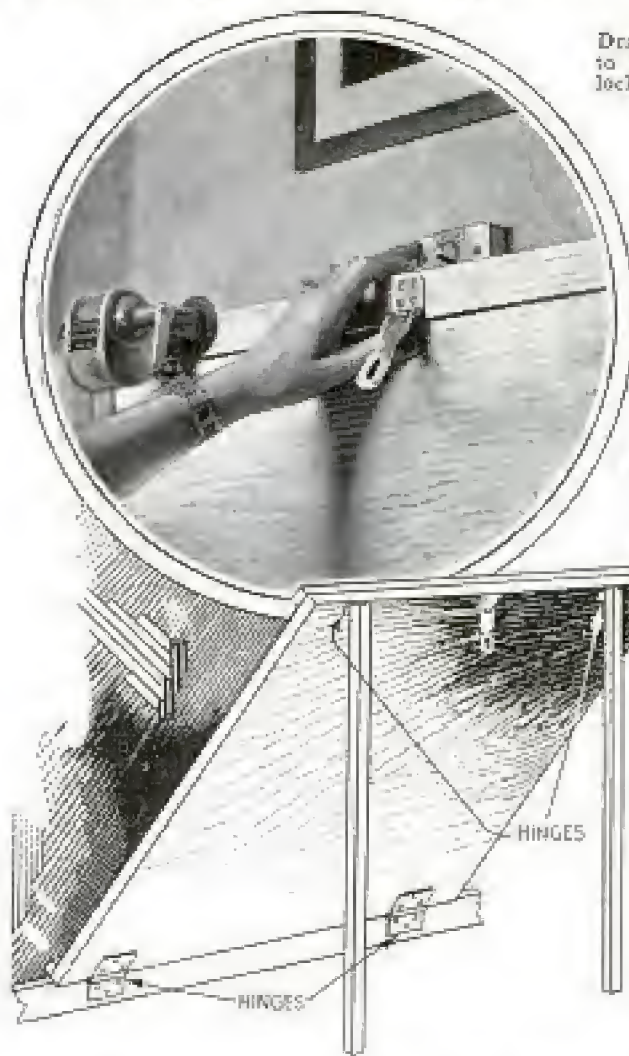
To prevent the loss of a chisel when a glancing blow from a hammer knocks it out of the hand, loop two rubber bands together, fasten the end of one band around the shank of the chisel and slip the other band over the wrist as shown. The bands will not interfere with the work.



Rivet Mends Resistance Wire

Broken resistance elements used in electric stoves, toasters and other electrical appliances, can be repaired by fastening the broken ends together with a small brass rivet. Bend the broken ends of the wire to form eyes to fit the rivet, which is peened over to make a tight electrical connection. Such a repair will last longer than the remaining part of the element.

Folding Drawing Board Padlocked to Wall



Drawing Board Hinged to Wall Can Be Padlocked When Not in Use

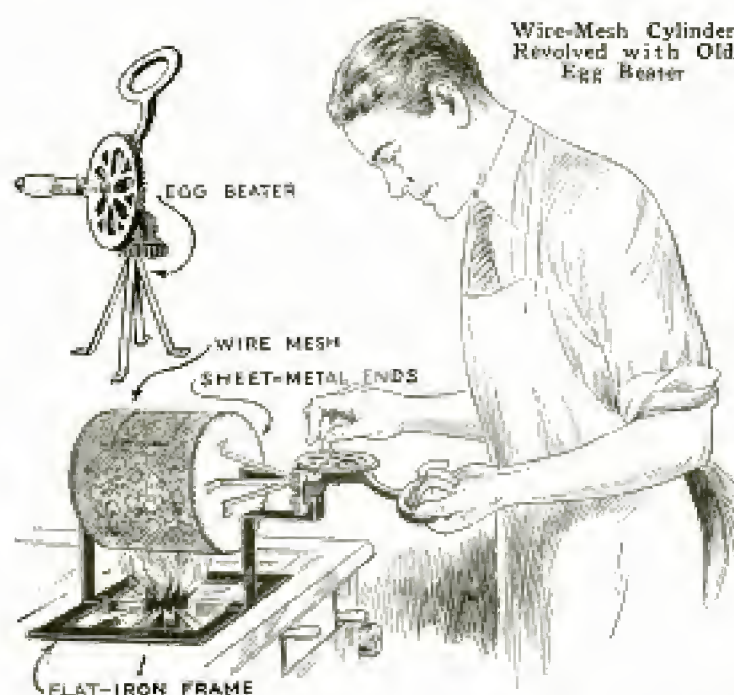


provided, as shown in the photo insert. The board, with a drawing in place, can be folded against the wall and a padlock on the hasp may be used to lock it. It is also a good idea to attach a pencil sharpener to the underside. Such a board is especially handy for those who are doing drafting in their spare time. It takes only a few minutes to unlock it and set it up for use.

Water Penetration through Brick and Mortar

If you have a drawing board that is always in the way, or in some place rather difficult to reach, try mounting it against the wall where it occupies scarcely any space, yet can be dropped down in an instant ready for use. An ideal place for attaching the board is between two windows. Almost any wall space of sufficient size can be used, however. Across the bottom of the board fasten a wooden strip to form a ledge for holding pencils and other instruments, and then attach the top to a cross strip with hinges. At the corners, on the underside, hinge two legs which should be of such length that, when the board is tilted at the proper angle, they will rest against the baseboard or on the floor. Lengths of cord can be used to limit the fall of these legs. For holding the board up against the wall when not in use, a hinge hasp and staple, the latter raised flush with the board on a block, are

When water penetrates through a brick or masonry wall during a rainstorm, the U. S. bureau of standards has found that the water usually enters through the cracks between the bricks, not through the bricks themselves. This is due either to shrunken mortar or poor workmanship. Experiments have shown that a brick must be highly saturated to transmit water to another material and that, under normal conditions, it is not likely to absorb enough water to wet interior plastering. As a precaution, however, it is a good idea not to plaster directly on the bricks in an 8-in. wall, but to put lath over the bricks, or use metal ties in place of the header bricks.



Wire-Mesh Cylinder
Revolved with Old
Egg Beater

Rotary Corn Popper Fits Gas Burner

Here is a rotary corn popper that turns the kernels over completely and thus keeps them from being burned, which prevents popping. It consists of a flat-iron frame carrying a cylinder with sheet-metal ends and wire-mesh sides, in which a door is made for putting in and removing the corn. An old egg beater is adapted to drive the cylinder.

Celluloid for Protection of Paper around Wall Switches

In order to avoid soiling the paper around a switch on a wall, remove the plate, cut a piece of clear celluloid large enough to extend about $1\frac{1}{2}$ in. beyond the edges of the plate and replace the latter with the celluloid underneath. Celluloid is easily washed and will not hide the design of the paper.

Preserving Fiber Records

The tendency of new fiber phonograph records to warp can be overcome by cementing them together. This will not damage them, as they are played on one side only. Duco cement is good for this purpose. After the records have been joined in this way, place them on a smooth surface and put a heavy weight on them until the cement has dried.—R. V. Silliman, Minneapolis, Minn.

How to Determine a Faulty Coil

Faulty coils are sometimes the cause of an elusive miss in a motor which is especially noticeable at slow speeds or on hard pulls. A miss caused by a coil will not always be evident on the same spark plug; sometimes the motor may even stop firing and then immediately pick up again, although it will probably idle fairly well unless the coil is dead. The best way to check a coil is to replace it with a new one and drive the car for a while. If this does not show any improvement, the cause is probably due to the condenser, although the coil itself usually wears out first. A defective coil or condenser may work satisfactorily at times or it may stop functioning entirely, leaving you stranded, perhaps several miles from a garage. Therefore, it is best to replace the defective part as soon as trouble shows.

Improved Balance Scale Uses Coins for Weights

Made from a wooden mixing spoon, this quickly improvised scale for weighing chemicals is fairly accurate. The balancing center of the spoon is determined and a hole drilled through it at this point for a nail which serves as a pivot, the ends of the nail being stapled to two blocks. A small wooden block under each end of the spoon acts as bumper to prevent the scale from tipping too far. United States coins that are not worn, can be used for weights. A penny weighs 48 gr., or .1 oz.; a nickel, 77.16 gr.; a dime, 38.58 gr.; a quarter, 96.5 gr.; a half dollar, 192.9 gr., and a silver dollar 412.5 grains.



AT HOME on the

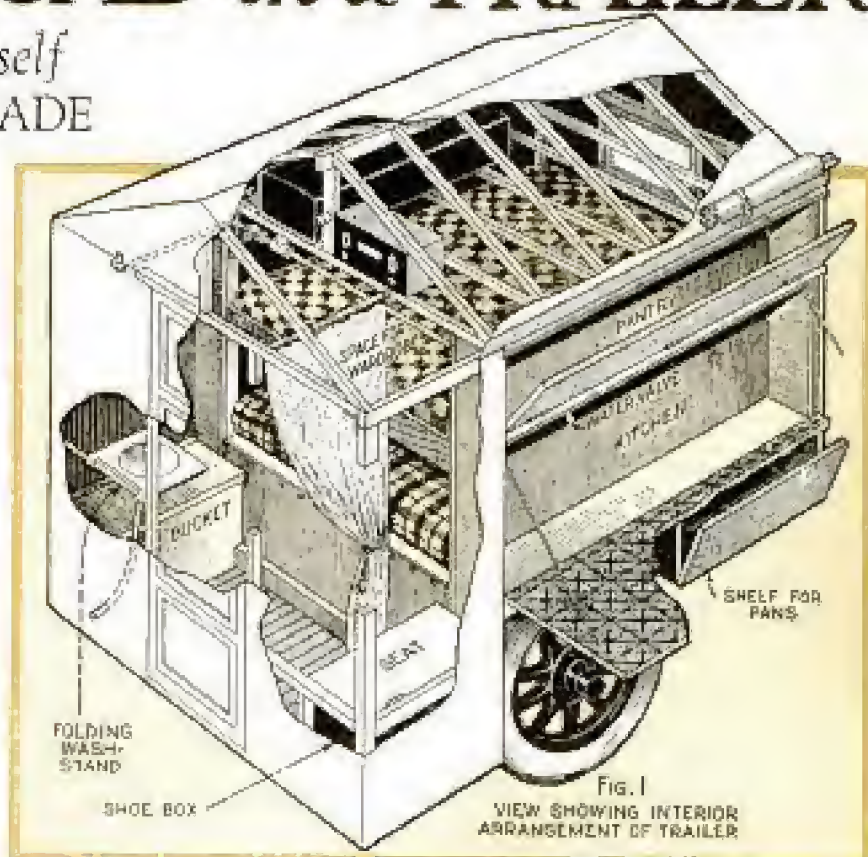


ROAD in a TRAILER

Tour Pays for Itself
from SAVINGS MADE
in RENT

Here is an ideal touring trailer incorporating almost all home conveniences. Although only five and one-half by eight feet in size, it includes two full-size beds, running water, electric lights and a radio, besides a kitchen, pantry, wardrobe and several storage bins. Two years of continuous service have proved this trailer practical in every detail.

By A. RUHLAND
PART I



AT a cost of about \$90, which includes new tires, this trailer can be built by anyone handy with tools. The total weight is approximately 750 lb., which is distributed so well that, when suitably hooked to a car, it is scarcely noticeable. Furthermore, there is very little additional gasoline consumption.

First get the front end of a light car from an auto wrecking yard. This should include two springs and the frame, which is sawed off about 3 in. from the point

where the springs are attached. A Ford front end cannot be used as it has only one spring. In the illustrated trailer, an Essex front end was used, the axle being underslung. Then get two rails of 2 by 4-in. ash or oak, 6 ft. long, and bolt them to the frame. Hardwood washers, 4 by 4 by 1 in., separate the rails from the frame, in order to allow the spring shackles to work freely, and lock washers are used under all nuts throughout the entire construction. The circular insert in Fig. 2

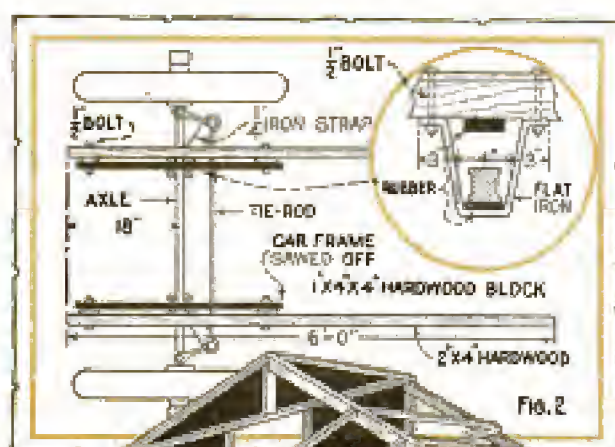


FIG. 2

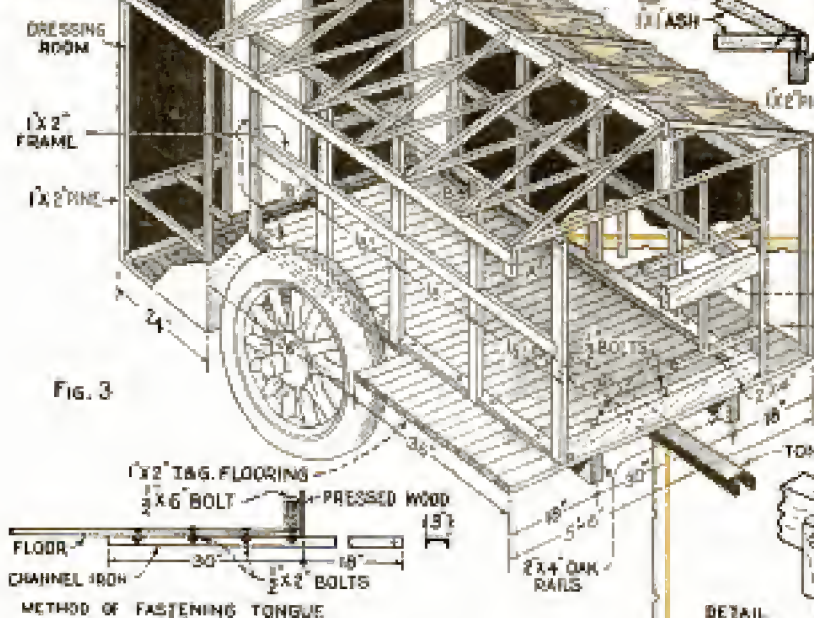


FIG. 3

shows a snubber arrangement, which consists of two lengths of flat iron, bent to a U-shape and bolted to the underside of the rails to pass underneath the axle. Rubber pads are attached to both the rails and to the snubbers. It is also necessary to fasten the wheels rigidly in line parallel to the rails, which is done by means of two $\frac{1}{4}$ -in. iron straps, bolted to the ends of the tie-rod and to the axle or frame. The rails should project 18 in. beyond the axle, as shown in Fig. 2. Tongue-and-groove pine flooring, $2\frac{1}{2}$ in. wide, is laid on the rails. The tongues should be painted and the flooring fastened down with $\frac{1}{4}$ -in. No. 10 flat-head wood screws.

Next, the framework is erected, first the inner sides, then the roof and finally the outer sides. Use 1 by 2-in. stock, joining the ends as shown in Figs. 3 and 4. The uprights are spaced 18 in. apart, center to center. As soon as the side framing has been made, $\frac{3}{8}$ -in. pressed wood is screwed on the outside with $\frac{7}{8}$ -in. No. 6 flat-head

screws. The sides are then screwed onto the floor, with the outer edge exactly 7 in. from the edge of the flooring, which leaves 4 ft. between the sides and places them inside of the wheels. Temporary bracing is used to hold the sides in position until the front piece of pressed wood can be screwed on. This piece extends to the edge of the floor on both sides. Do not

bother with putting on the roof trusses or window frames yet, as it is better to do this later. Two 2 by 4-in. cross-pieces are laid on the floor at both ends and are fastened to the rails beneath with $\frac{1}{2}$ by 9-in. carriage bolts. The upper

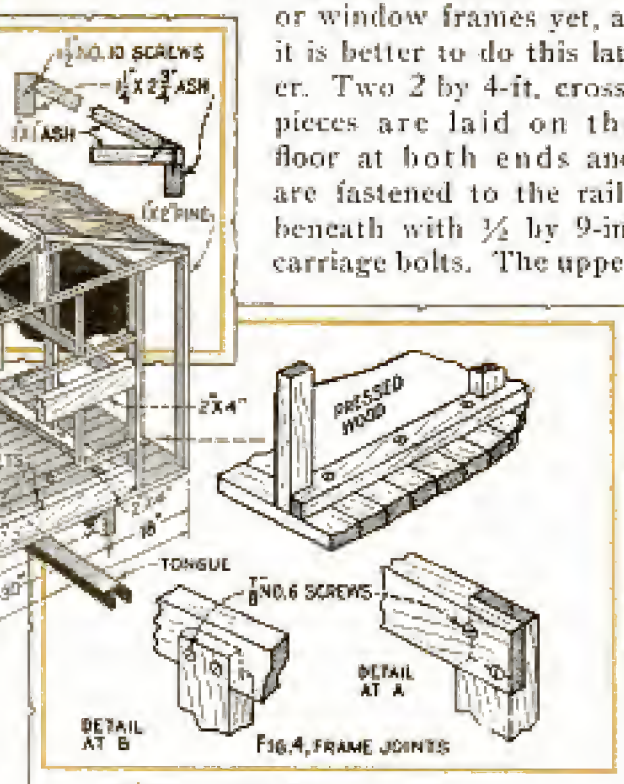


FIG. 4, FRAME JOINTS

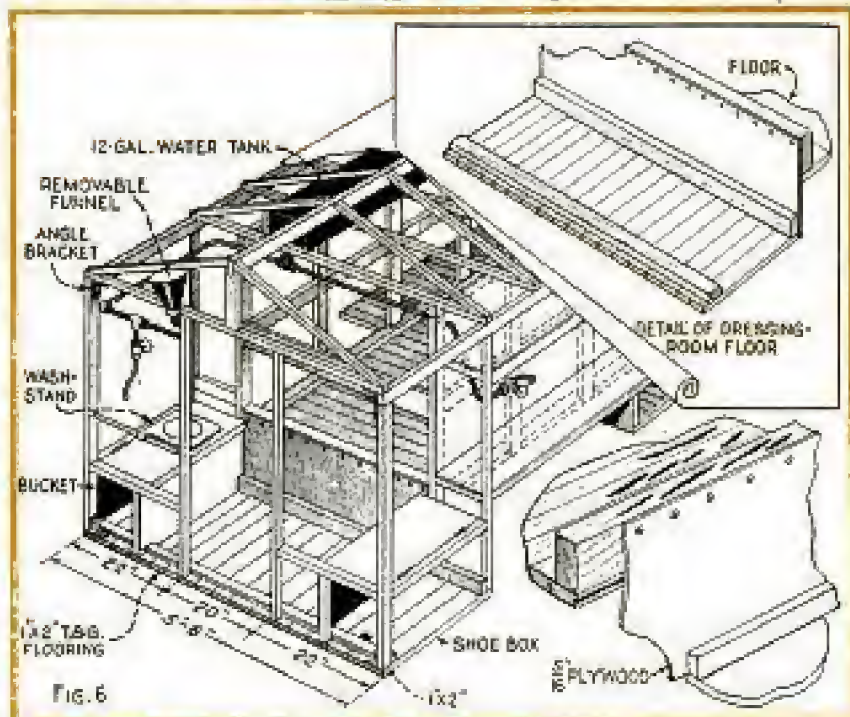
bed frame is located about 2 ft. above the lower one. In building the frame to support the upper mattress, apply the bracing crosswise at 6-in. intervals. A piece of pressed wood is screwed onto the underside of this framing to provide a smooth ceiling over the lower bed, and another piece is screwed to the top side to distribute weight evenly.

The roof framing is applied before the dressing room is erected, as the latter is partly suspended from the roof. Details of the roof framing and the method of making the joints are given in Fig. 3. All the trusses should be spaced 1 ft. apart except the last two, which are 2 ft. apart in order to provide more head clearance in the room. Of course, the roof must project 9 in. beyond the sides so that its edge will be in line with the edge of the floor. The ridge of the roof is 14 in. above the sides in order to make the dressing



room high enough and also to provide a storage space. Pressed wood is screwed onto the roof trusses and a cove molding is applied, upside down, on the ridge to prevent leakage, which forms an excellent ridge roll. Triangular pieces of composition board complete the front inclosure.

To construct the dressing room, examine the right-hand detail of Fig. 6. Note that the flooring is screwed to the underside of the 1 by 2-in. crosspieces, one of which is laid flat and the other on edge. The latter is screwed to a piece of $\frac{5}{8}$ -in. three-ply veneer, 14 in. wide, which is in turn screwed to the 2 by 4-in. crosspiece at the rear. This places the dressing-room floor 10 in. below the lower bed. The framework of the dressing room is then put in place as indicated, after which the sides and back are covered with pressed wood, leaving the center part open for the installation of a door. Angle brackets should be used in attaching the dressing-room frame to the roof and floor, in order to obtain maximum strength at these joints. The shoe box and bucket box can now be built in and provided with hinged tops, after which the water tank can be installed on



the joists above the upper bed as shown in Fig. 6. For the water pipes, the $\frac{1}{2}$ -in. size will be found large enough. The water system runs to the folding washstand and also through the right wall to the compartment that is to serve as the kitchen. Ordinary hand valves are screwed onto the end of the pipe at the service points, and a length of hose is added for convenience. Filling of the water tank is done at the rear, the pipe projecting above the level of the tank, and on the outside of the trailer, permitting a funnel to be inserted as indicated in Fig. 6.

Figs. 7 and 8 show how the storage

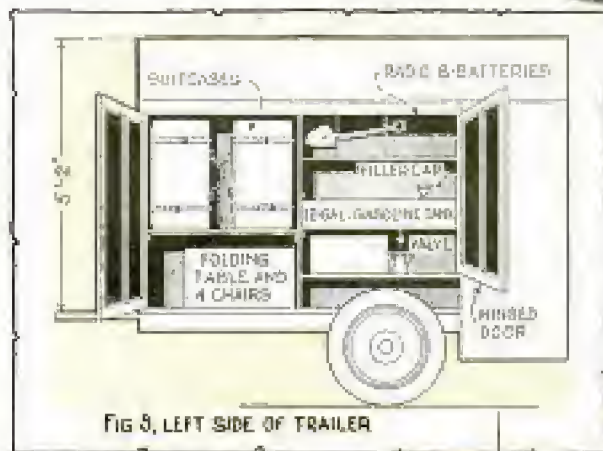


FIG. 9, LEFT SIDE OF TRAILER

space on the left side of the trailer can be utilized. After the partitions have been built, door frames, covered with pressed-wood panels, are hinged on as indicated. You can divide the storage space as you see fit, although the arrangement illustrated has been found highly satisfactory. One compartment holds two suitcases, with sufficient space underneath to store a folding table and four folding camp stools. At the top of the rear compartment, radio B-batteries were installed, extra inner tubes, a shovel and other equipment. A 12-gal. reserve gasoline tank, placed just below this shelf, is handy to keep fuel for the cookstove, and a measure is located near at hand as shown.

If small articles are placed in these com-

partments, rubber bands, cut from old inner tubes, are tacked to the partitions and the articles slipped between to hold them securely without rattling. In the case of larger articles, other arrangements can be improvised. Fig. 9 shows an end view of the trailer and the installation of accessories. The radio aerial consists of a length of phosphor-bronze stranded

cable running back and forth on suitable insulators, attached to the underside of the roof trusses. On the right side of the trailer, the kitchen pantry and pan shelves are arranged as shown in Fig. 10. The kitchen table is built up of 1-in. stock and is hinged horizontally so that it also serves as the side. Lengths of furnace chain are fastened to the table top and to the side of the trailer to hold the table horizontally when open, as shown in Fig.

11, and to take the weight of the table as it has no legs. The inside of the table is covered with oilcloth and as many compartments as are needed are built to hold dishes, groceries and a folding gasoline cookstove. In arranging the kitchen, it is best to plan a definite place for each article, where

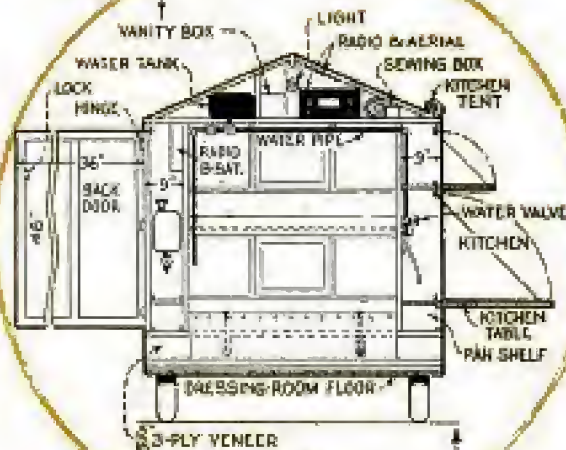


FIG. 9, END VIEW

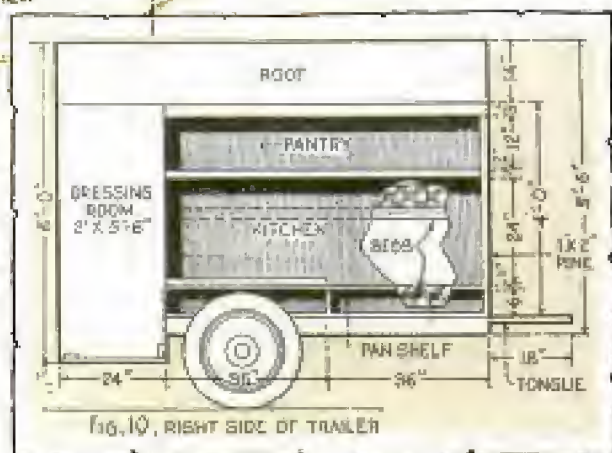
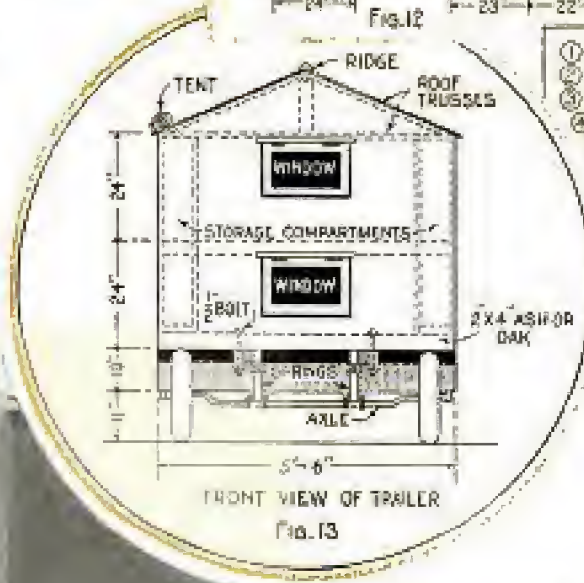
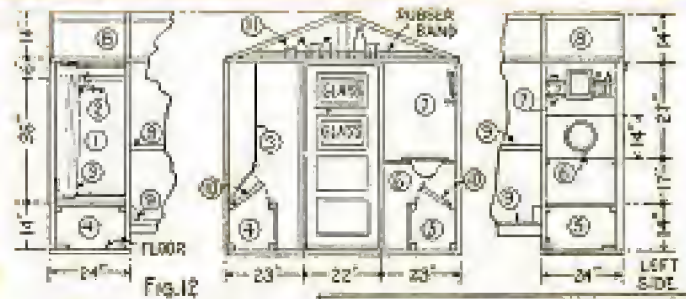


FIG. 10, RIGHT SIDE OF TRAILER

it can be held snugly. The same plan is followed in allotting space for canned goods in the pantry. Notice that there is a water tap on the kitchen side for convenience in washing dishes.

During rainy weather, the open-air kitchen can be quickly inclosed by means of a tent shown in Fig. 5. When not in use, this part of the equipment is rolled up and strapped to the edge of the roof as shown. It is only a moment's work to unroll it and set it up. The center and corner poles have pins at the ends to fit eyes sewed in the canvas. The tent is, of course, especially made for the purpose and consists of a large tarpaulin, cut and sewed together to form a top and three sides. The edge of the top, which has no sidepiece sewed on, is tacked to the edge of the roof.

In Fig. 13 is given a front view of the trailer, showing the window location, and Fig. 14 shows how the windows are swung open for



- ①-CLOTHES CLOSET ⑤-BOX FOR BUCKET
- ②- " " HANGER ⑥-WASHSTAND
- ③-CURTAIN ⑦-MIRROR & SHELF
- ④-SHOE BOX ⑧-CEILING STORAGE
- ⑨-BEDS ⑩-SEATS ⑪-MEDICINE ETC.

ventilation. The details of their construction and also the construction of the door, trailer tongue, hitch, electrical connections and other parts of the assembly, that have not been covered in this article,

will be given in the second installment which will appear in the April issue.

Short Cord from Cellophane

When a piece of short cord is needed and none is at hand, improvise one from the cellophane taken from a cigaret package. The cellophane, when twisted, will tie easily and will not be affected by moisture.



Photo Flash Lamp Takes Underwater Views



Underwater Photos Successfully Taken with Aid of Photo Flash Lamp and Sheet-Metal Hood on Camera

touched the floor. As surface ripples distort images, a specially made hood, fitting the camera, was lowered under the surface of the water. The hood was made of sheet metal and fitted with a plate-glass window and was submerged until the window was about 3 in. below the surface. The camera was then placed inside of the shield, as shown in the upper photo, so that the lens was even with the water level. The shutter was set for one-fifth of a second, and the lamp flashed during the exposure.

a synchronizing switch being employed to provide perfect coincidence between the opening of the shutter and the flash. The slight blurring of the lines of the swimmer in-

In the past, underwater photographs taken indoors with the aid of a flashlight have been impossible, as the illumination produced by flashpowder set off above the surface of the water scarcely penetrates at all, but is almost all reflected. The taking of such photographs necessitates a high intensity of light beneath the surface, such as can be provided by a submerged photo flash lamp. In the case illustrated, water, 7 ft. deep, in the Cleveland Y. W. C. A. pool was no barrier to the taking of the picture. A single lamp, lowered into the water, flashed its nearly one-half million candlepower of light as the diver, Miss Jean Duncan, swimming instructress,



dedicate her own movement. Undoubtedly, this method of taking underwater exposures will prove advantageous for other purposes, such as the photography of aquatic life and vegetation.

Care of Chromium-Plated Car Parts

Chromium-plated parts and fittings on your car should be treated with care if the bright finish is to be retained. This plating is very thin and depends on a sub-plate of copper, or copper covered with nickel, for its adhesion. If the chromium-plate is deeply scratched or broken, the metal underneath will soon corrode and cause the chromium to peel off. Owing to the fact that the hardness of chromium

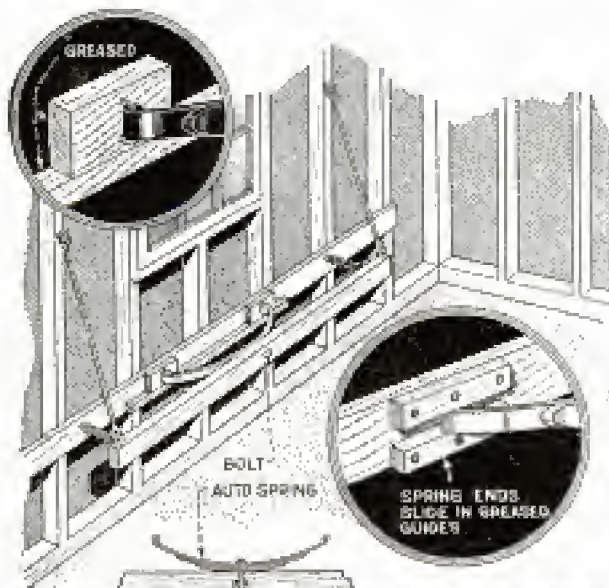
is almost equal to that of a diamond, ordinary polishes have no effect on it except to remove grease and dirt. As the plating is applied extremely thin, it is sometimes porous, which in time will allow enough dampness to reach the underlying metal to cause peeling. To avoid this trouble, it is a good idea to polish frequently with an oiled cloth, especially during rainy weather, in order to keep the plating covered with a thin coat of oil.—Geo. A. Luers, Washington, D. C.

Caster Aids in Cutting Limber Wood

When ripping or plowing limber wood with a circular saw, a wooden spring clamped to the saw table is often used for holding the material against the fence. If the end of the spring is large enough, drill a hole to receive the shank of a caster so that there will be a rolling, instead of a rubbing contact against the material. In this way, the spring can be set up more firmly without danger of scoring or marking the material.—John E. Hyler, Peoria, Illinois.

Spring Bumper Protects Rear Wall of Garage

A spring bumper that absorbs shocks caused by driving a car into the rear wall of the garage, consists of a Ford-car front spring bolted to a 3 by 4-in. plank. This assembly is hung on the wall, at the same height above the floor as that of the bumper on the car, by two rods which are fastened to the studs and plank with screweyes, as shown. In order to allow for the flexibility of the spring, a wooden block, sliding in a greased guide, is fastened to each end of it. These guides are nailed to a 2 by 6-in. plank, also nailed to the studs. A short chain, fastened between the two planks at each end, checks the rebound of the spring and prevents tipping of the bumper plank, should one end be hit harder than the other. With such a bumper, damage to the garage wall can usually be avoided.



Bumper Fastened to Garage Wall Absorbs Shocks and Prevents Studs from Being Dislodged

Tin-Can Scoop Helps to Clean Dirt from Post Holes



Scoop for Cleaning Out Post Holes

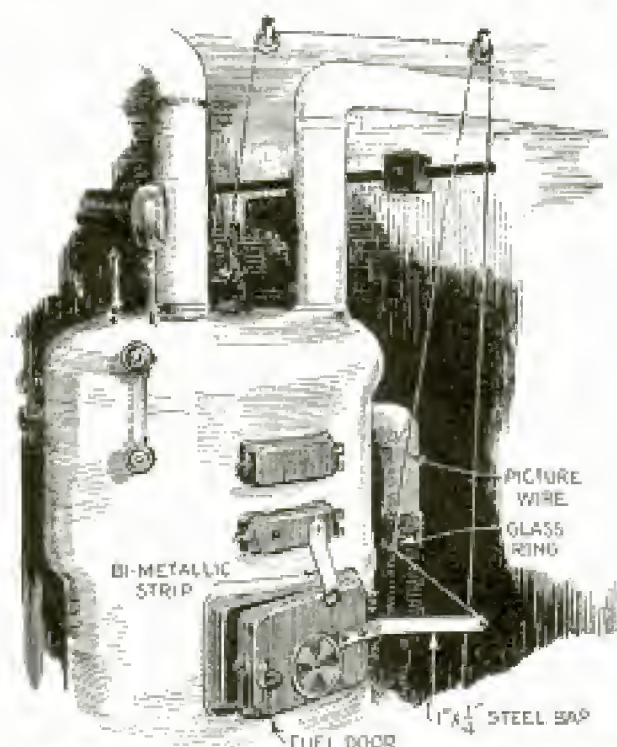
The illustrated clean-out scoop is for persons who have no post-hole digger, but find it necessary to use a spade for the purpose. The scoop is made by cutting one side from a tin can and nailing it to the end of a broomstick.

Mixing Water-Color Stencil Paint

To make a water-color stencil paint, mix any dry color pigment in a solution of white dextrin, 4 oz., dissolved into 6 fluid oz. of cold water. When dry, the color may be applied by mixing it with oil or damar varnish. This pigment is also the basis of the many compounds for imitating the graining of various woods. Paint manufacturers grind the pigment in water with or without the binding medium. Final thinning of the ground paste is done with water, 2 parts, and alcohol, 1 part. The addition of denatured alcohol causes quicker setting and prevents the graining from flowing together.

Writing Ink for Photographs

An ink for use on photographs can be made by mixing potassium iodide, 1 oz.; iodine, 45 gr.; gum arabic, 45 gr., and water, 3 fl. oz. Write on a dark portion of the photograph. The writing will soon bleach and add an extra touch to your pictures.



Fire Door. Controlled by Thermostat, Checks Fire and Prevents Overheating in Mild Weather

Thermostat Operates Fire Door

During mild weather when the damper and draft controls on a boiler do not check the fire sufficiently to prevent overheating, a thermostat attachment to open or close the fire door will usually solve the problem. First a steel bar is bent and bolted to the door, as shown, and a length of picture wire is fastened to the bar, after which it is run through a glass ring anchored behind the bar and fastened to the arm of the thermostat in such a way that the door is opened by the arm pulling on the wire. A length of flat spring or a bi-metallic strip, bolted to the clean-out door and bent over the fire door as indicated, holds it closed when the thermostat is not

acting on it. The door latch, of course, must be removed in order that the arrangement may work freely.

Testing Speed of Camera Shutter

Anyone can test the speed of a camera shutter by the following method: Attach a flashlight to a wooden block and mount it across a lathe faceplate, or a grinder spindle, so that it can be rotated at high speed without vibrating. Use a flashlight of sufficient length to produce a brilliant circle of light from 4 to 6 in. in diameter. For shutter speeds over $1/100$ second, rotate the light at 2,000 r.p.m., for $1/25$ to $1/50$ second, 1,000 r.p.m., and for $1/10$ second either 500 or 1,000 r.p.m. Remove the back and lenses from the camera and set it up so that you can see the circle of light produced by the lamp through the shutter from the front. If one eye is held in this position, and the shutter snapped while the lamp is rotating, a sector of light will be retained on the retina of the eye long enough for you to determine at what point of a revolution the lamp was visible. By dividing the fractional part of the circumference that the arc covers by

the revolutions per second, the time that the shutter was open will be found. On large shutters, a more accurate result can be obtained by photographing the sector of light with the camera focused on the lamp. This will produce a line of black on the negative when developed, varying in intensity and width according to the light received at any particular instant. Such a test should be made with the lens wide open. The length of the arc of approximately equal density and width will be the true value.

\$1,000 in CASH

and one thousand high-grade jackknives for the best examples of whittling done entirely by means of a jackknife.

Models must be shipped, prepaid, in suitable packages to avoid breakage in transit, with a tag bearing your name and address. Contest closes July 1, 1932. Awards will be made by a competent board of judges and in the event of a tie for any prize offered, a prize identical in all respects with that tied for will be awarded to each tying contentant. A circular containing full details of the whittling contest will be sent upon request.

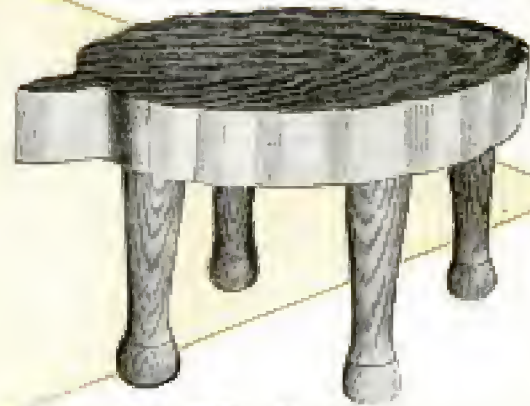
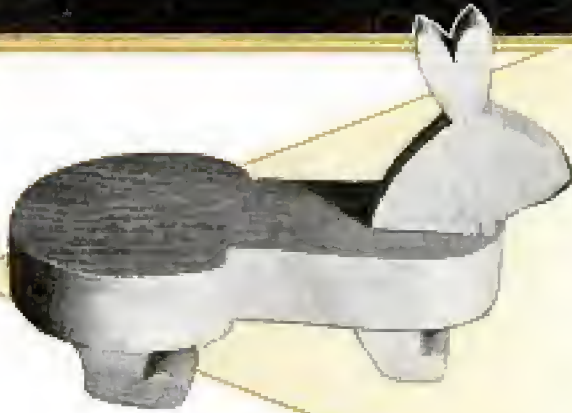
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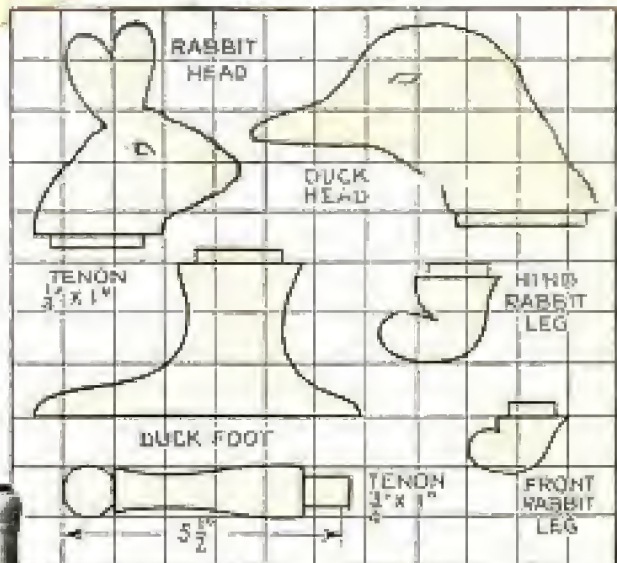
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These PLAYROOM SEATS Resemble Animals



PARTICULARLY suited for children's playrooms, these animal stools can be made with little labor and expense. The parts can be cut out by hand or on a power-driven scrollsaw or bandsaw. Any kind of wood can be used, although a close-grained material, such as white pine or poplar, is preferable. For thickness, 1-in. stock will do, especially if it is hardwood, but $\frac{1}{4}$ or $\frac{1}{2}$ -in. stock is much better as it is less likely to crack.

The designs shown in the illustrations include a duck, a rabbit and a turtle, and although the latter is not exactly true to form, because of its long legs, it serves the purpose of a seat better. In making the turtle, holes are drilled in the underside of the body, and the legs, which are turned as indicated, are glued into these holes. The head of both duck and rabbit are attached in a similar manner, a recess being cut to receive the tenon on the neck. As the feet are subjected to considerable strain, it is best to drive in a long wood screw from the top, first drilling and countersinking the top to re-



ceive a screw shank, and then drilling a small guide hole in the feet to prevent the screw from splitting the wood. The hole in the top is filled with a wood plug, which

is sanded flush with the top. The patterns for all the parts are given in the cross-hatched sections, in which each division represents 1 sq. in. On the duck, the two large feet are set rather far apart so that it will not have any tendency to tip over. Two wings are suggested, but their tips



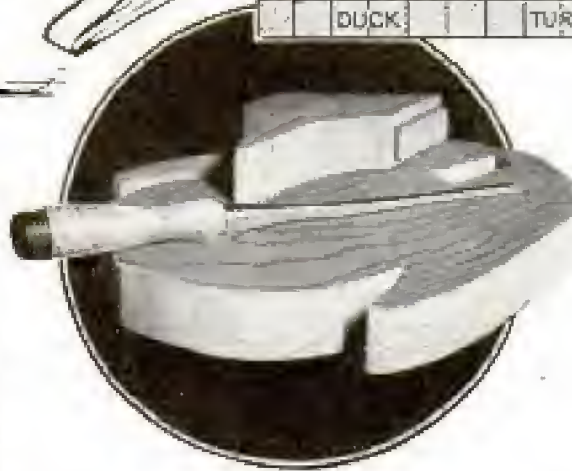
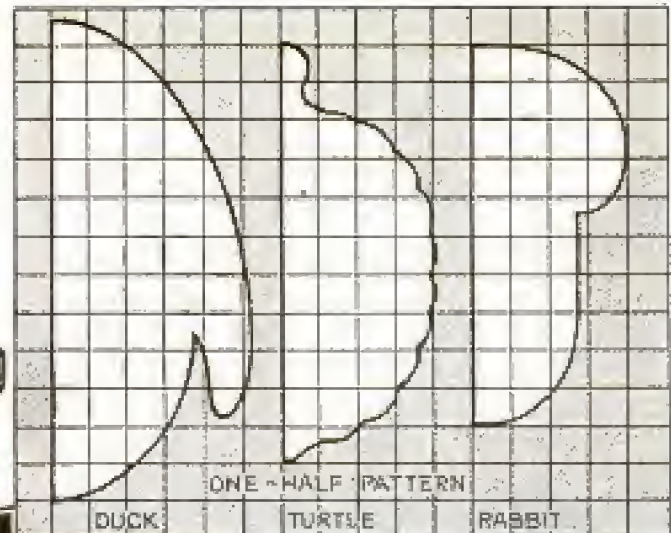
should not extend far or they are likely to break off with rough usage.

In laying out the pattern on the stock, you should remember that narrow portions are likely to break off rather easily if the grain of the wood runs crosswise. For this reason the grain should run lengthwise. Besides the patterns shown here, it is easily possible to design numerous others, sketching and redrawing the figures on paper until a satisfactory shape is obtained, and then tracing them on the stock by means of carbon paper.

For the finish, bright colors are generally considered in keeping with the playroom. Either lacquer or enamel can be used, but before applying it, the work should be thoroughly sanded and given a priming coat of shellac. A two-color job, done in complementary colors, is, of course, preferable to a one-color job, especially if such vital portions of the anatomy as the eyes and mouth are simulated, and the wings are shaded to indicate feathers.

Broken Grindstone Can Be Repaired with Flake Shellac

When a piece has been broken out of a grindstone, it can be cemented into place

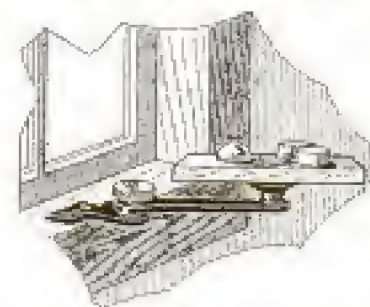


again with flake shellac. First, gradually heat the stone until it is almost too hot to touch. Then melt the shellac and brush it over the broken edges, press the piece and the stone together and allow the work to cool gradually. When properly made, this

repair is waterproof and can be detected only on close inspection. While this is a good repair, it will not, of course, stand so much strain as a perfect stone and therefore the latter should not be rotated as fast as normally.

A Swinging Shelf from Discarded Windshield Parts

Made from the arm and bracket of an old windshield, and screwed to a window casing, this swinging shelf is handy for



holding small parts when it is necessary to work on them under good lighting conditions. When not in use, the shelf can be disconnected and

put away. Draftsmen may also find such a swinging tray a handy attachment for their drawing table.

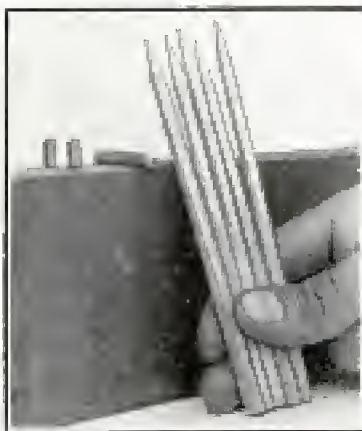
Noise from Slamming Door Reduced with Rubber Heel

Noise caused by the slamming of a door can be reduced by the use of old rubber heels. Nail one heel to the edge of the door about 3 in. from the top, and another a similar distance from the bottom, fastening them so that they will extend a little beyond the edge of the door. In this way, the rubber strikes the door-stop when closing the door, and deadens the noise from the impact. The heels will last a long time.

How to Make a Good Wall Size

Wall sizing that will not crack or peel off can be made by dissolving whale-oil soap, 4 oz., fine pumicestone, 4 oz., powdered alum, 3 oz., and sulphate of zinc, 1 oz., in warm water. Pour this solution into 10 lb. of calcimine and run the whole through a 16-mesh screen three or four times in order to remove the lumps and to more thoroughly mix the ingredients. This size becomes very hard when put on the wall. It is necessary, of course, to clean the walls perfectly before applying the size.

Dowel Pins from Meat Skewers



Meat skewers, cut to various lengths, make a good substitute for small dowel pins. These sticks are made in several sizes, and your butcher will supply them.

Mold and Pattern for Small Castings

Where only one or two small castings in brass or other soft metal are required for models, it is a simple matter to cast them in a plaster-of-paris mold formed with a wax pattern. The wax used for this purpose should have a high melting point. After the pattern has been made, it is attached to a short nail which in turn is



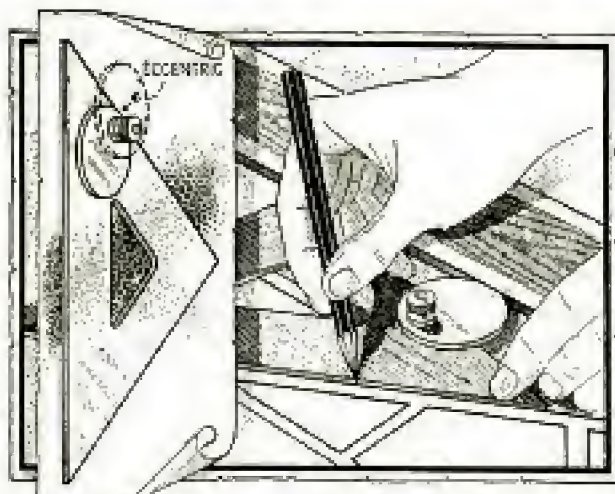
Molds for Small Model Fittings of Brass Made with Plaster Mixture and Wax Patterns

fastened to a metal base with molten wax. As the hole left by this nail is used as an entrance or "sprue" hole for the metal, it should be of a sufficient size to allow the molten metal to flow in easily. A short pipe nipple or tube is placed over the pattern and is filled with a mixture of finely powdered marble dust, 2 parts, and plaster of paris, 1 part, to which water is added to form a rather stiff paste. After the paste has dried, remove the metal base and nail. Then heat the nipple to melt the wax pattern, which will be absorbed by the plaster, leaving a mold of the pattern. Where the work must be duplicated, it is, of course, necessary to make a new mold.

Making Emergency Shipping Tags

When your supply of shipping tags has become exhausted, substitutes can be improvised from paper clips, cardboard and string. The cardboard is cut to the desired size and the strings are attached to them with small paper clips of the type shown.





Triangle Fitted with Eccentric Is Useful for Drawing of Screw Threads and Section Linings

Eccentric Makes Triangle Adjustable

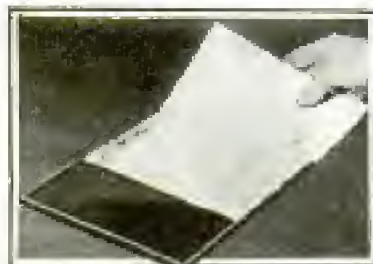
Any 45 or 60° triangle can be made adjustable to various angles by fitting it with an eccentric made of wood, celluloid or hard rubber, which is fastened to the triangle by means of a small countersunk flat-head screw fitted with a knurled nut. When not needed, the eccentric is removed or swung out of the way. If desired, graduations can be cut on the eccentric to indicate the different angles. Such a device will be found useful for drawing screw threads and section linings.

Ink Eraser Removes Mercury Amalgam from Watches

Gold or silver articles, such as watches and rings, that have become coated with mercury amalgam are easily cleaned by using an ordinary typewriter eraser. This will leave a dull finish which may be left as it is or polished on a buffing wheel.

Holder for Enlarging Paper

Intended primarily for converting glass-plate holders into cut-film holders, a metal cut film sheath makes a support for bromide paper used either with a vertical or horizontal enlarger. It may be found



necessary to bend the edges of the sheath outward slightly before the paper will slide smoothly in the grooves

without bulging. These sheaths can be obtained in most of the standard paper sizes for a few cents.

Shellac and Wax Relieve Tight Dresser Drawers

Desk and dresser drawers that have a tendency to stick can be made to work by coating the contacting parts with shellac. This should be done in dry weather so that there will be no moisture in the wood to expand it. After the shellac has dried, the surfaces should be given a generous coating of floor wax. The shellac and wax should be applied to both the drawer and the groove in which it runs. This will provide a well-oiled surface for the contacting parts and will also help preventing them from expanding in damp weather.—Forrest L. Bezanson, Arlington, Mass.

Coat Hooks on Stepladder Support Work When Sawing

Two coat hooks, driven into the legs of a stepladder as shown, form a handy support for sawing small pieces. This



arrangement will take short boards less than 6 in. in width, and will save many trips to a sawhorse or other support.

Telescoping Clothesline Posts Aid in Retaining Beauty of Lawn

By using telescoping posts for supporting a clothesline, the beauty of a lawn will not be marred by an unsightly arrangement of posts and wire. Each post is made up of one 4-ft. length of 1-in. pipe and one 4-ft. length of 1½-in. pipe, both of which telescope into a 4-ft. length of 2-in. pipe, sunk in concrete below the surface of the lawn. A hole is drilled through each of the two smaller pipes, 10 in. from the lower ends, to take steel pins which support them when they are raised for use. The smaller pipe is capped at the upper end, the cap being drilled to take a ring for use in attaching the clothesline.—Philippe La Fee, Columbus, Ohio.

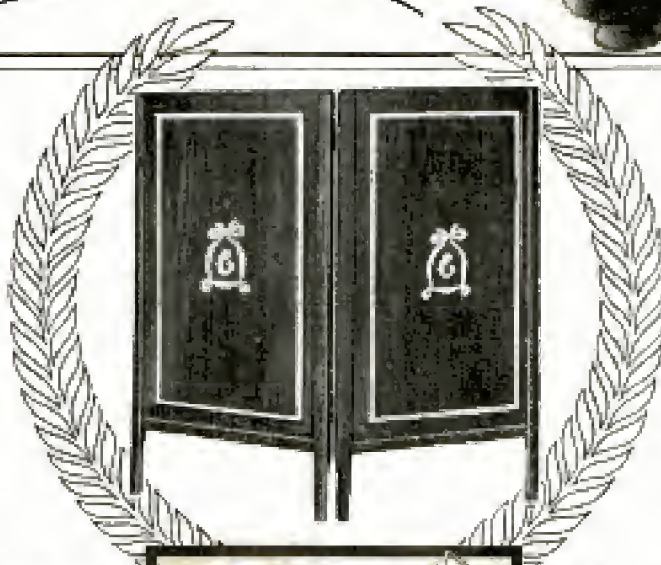


INLAYING *with Colored* *Plastic Wood* *by* W. Clyde Jamney



PLASTIC wood in colors offers unlimited possibilities of inlaying. Although solid wood may be used as a ground, plywood is best, except in the case of turnings, as the surface veneer can be removed easily and quickly.

The design is first traced or sketched on paper and is then transferred to the wood with carbon paper. The lines on the wood are cut with a very sharp knife and the edge of the part to be inlaid is undercut to hold the inlay. The knife blade should be ground and honed to a long bevel to insure a clean cut, and care must be taken to avoid chipping the edges. After the pattern has been cut, gently lift out the top layer of veneer by prying it up with the knife blade. If the pattern is more than 1 in. wide, it is better



to recess through the second veneer to the core stock, bringing the recess to a depth of approximately $\frac{3}{16}$ in. Where the pattern is of a regular form, the recessing may be done on a drill-press with a small router bit, as shown on page

511. A guide or jig is first scrollsawed slightly larger than the outline of the pattern and then clamped to the ground with the pattern outline located in the position desired, after which the work is placed on the drill table, and the spindle is lowered and locked so that the bit will cut the required depth. The drill is driven at

the highest speed, and the work must be held firmly on the table when moving it. A small, shallow recess may be filled with the plastic wood in one operation but a recess,

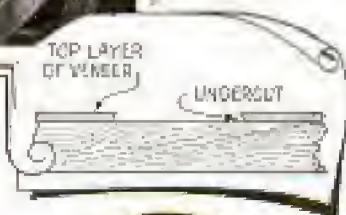
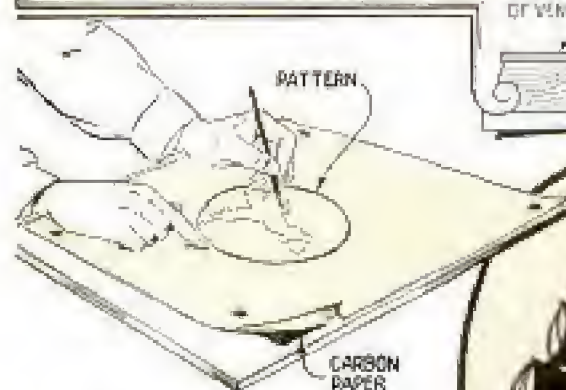
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Syracuse, N.Y.



short dowel, fitting the hole, to force the inlay into the recess.

To obtain a clear-cut appearance in the inlay, it must be finished very carefully. The excess material cannot be scraped or planed off without damaging the edges and it must be removed by sanding only, which can be done by hand or with a small sanding machine. If the work is sanded

by machine, as in one of the photos, use a No. 1/2 grit belt, and lift the machine off the work at intervals of a few seconds to prevent heating. Also, keep the machine moving while the belt is in contact with the work and be very careful not to cut through the thin face veneer of the plywood ground. When sanding by hand, fasten a long strip of sandpaper to a block. This gives greater bearing surface and al-



wider than 1 in. and deeper than the thickness of the face veneer, is best filled in two layers, allowing the first to become thoroughly dry before applying the second. Use a thin putty knife for filling the recess with plastic wood and work fast, as the material sets quickly. Build up the inlay slightly above the level of the ground and over the edges to allow for shrinkage while drying, which should take 24 hours. On large patterns, a board clamped over the work, with a sheet of heavy paper between them, will aid in leveling and forcing the material tightly into the recess. After two or three hours, remove the board and tear the paper off gently, then allow it to dry thoroughly before sanding. In filling round holes, press the material into place, let it set slightly, then use a

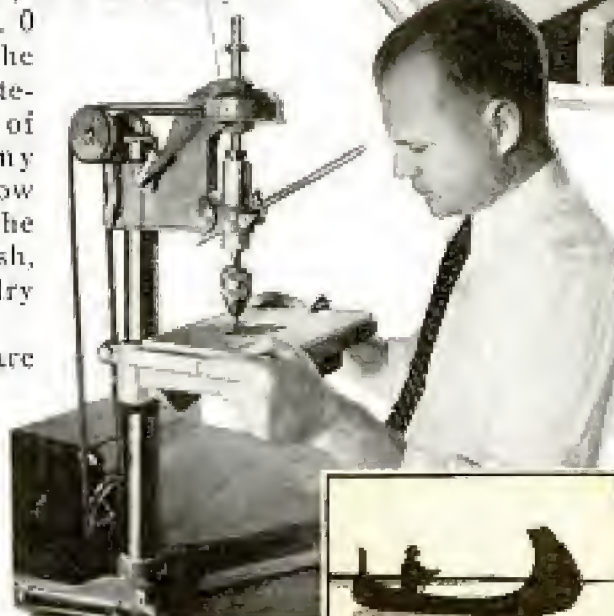


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A 434
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Tulsa Okla
W.B.*



low sanding without the ends of the block passing over the inlaid surface. In either hand or power sanding, the inlay is not finished flush with the coarse paper. In order that the inlay may be finished smooth and unbroken, it is necessary to use a finer grit, Nos. 0 and 00, to remove the remainder of the material above the level of the groundwork. Any openings, which show up at the edges of the inlay when sanded flush, are filled, allowed to dry and again sanded.

Where two colors are used with the edges meeting, the ground color is applied first. This is allowed to dry thoroughly, the joining edges are cut down square with a sharp knife and then



the second color is added. If the inlay is made on a turning, like the inlaid bowl shown in the headpiece, it is applied in the same way as described, allowed to dry, then sanded, taking care not to heat the work. Woodturners' cement or stick shellac may also be used for inlay work. It is melted into the pattern recess with

a soldering iron, and the excess material is sanded off, but shellac cannot be used for the first finish coat over

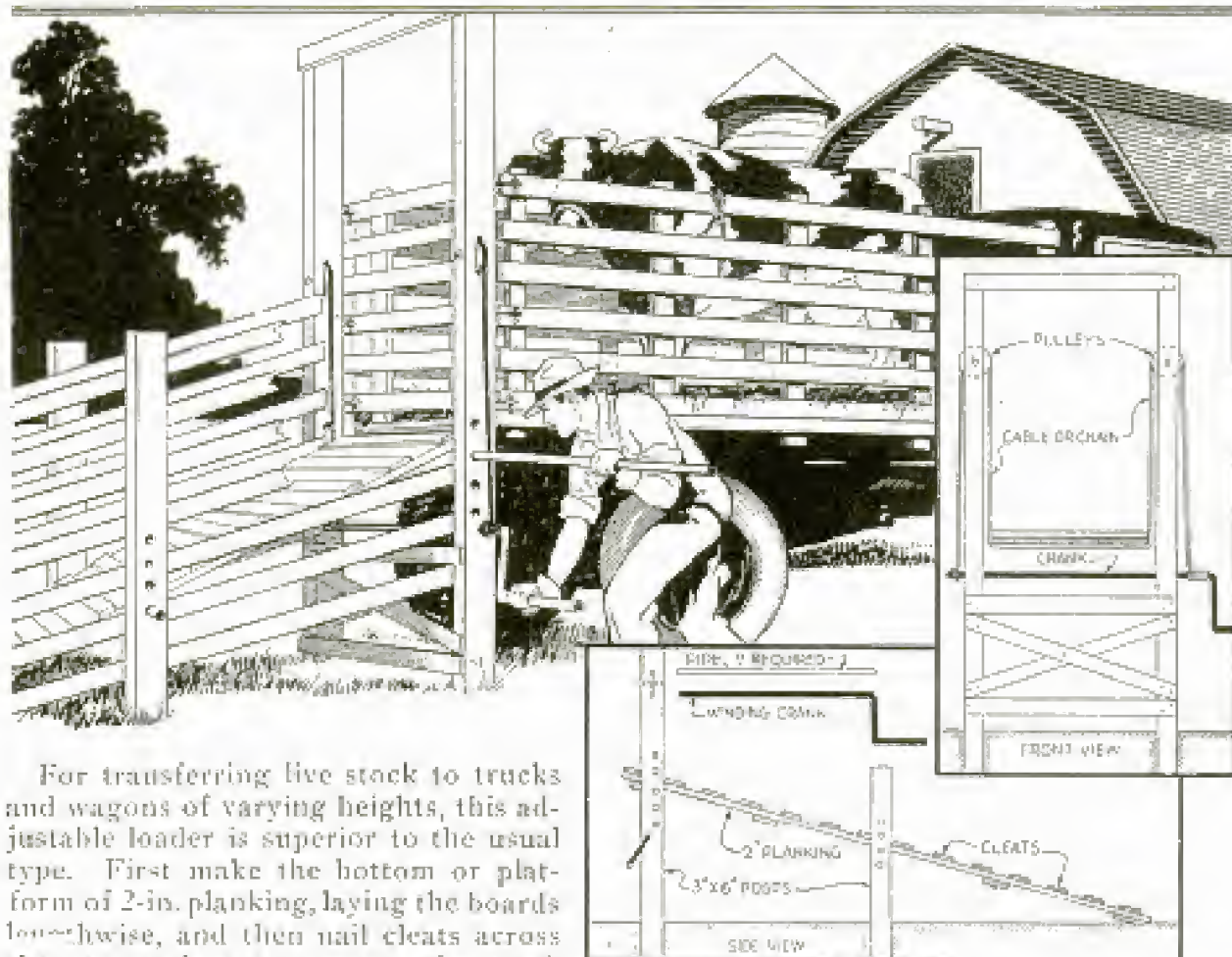
turners' cement as it acts as a solvent. Where the cement is used, the recess should always be undercut slightly and somewhat deeper than that needed for plastic wood. Either product is obtainable in a variety of colors.

Rough-Finishing Plaster Patches

Smooth plaster patches often show through tinting. To overcome this roughen the surface of the patch with a stiff-bristle brush, before the plaster has set completely, giving the patch the same texture as the adjoining plaster.



Live-Stock Loader Has an Adjustable Floor



For transferring live stock to trucks and wagons of varying heights, this adjustable loader is superior to the usual type. First make the bottom or platform of 2-in. planking, laying the boards lengthwise, and then nail cleats across the top surface to prevent the stock from slipping. The posts are 3 by 6-in. planks set in concrete, a vertical row of holes being drilled in the front and center posts to receive lengths of heavy pipe, which support the platform at various heights. The two front posts are also drilled to take a winding crank, made of heavy iron rod and bent as shown. Two lengths of wire cable or strong rope, fastened to the platform, are run over two pulleys mounted on the front posts, and

are then wound on the crank. The sides of the loader are nailed to the inside of the support posts in the usual way. It is a good idea to nail a metal or wooden strip vertically over the side boards at each post, to prevent the platform from catching on them when it is raised or lowered. In use, the platform is adjusted to the desired height by turning the crank, and the pipes are then inserted in the proper holes to support it in this position.

Applying Green Finishes on Brass

Verde and tiffany-green finishes can be easily applied to brass by anyone without special equipment. For the verde finish, dissolve white arsenic, 8 oz., into 1 qt. of warm muriatic acid, and add copper carbonate, $\frac{1}{2}$ lb. In another vessel, dissolve copper acetate, 2 lb., and ammonium chloride, 2 lb., in 2 gal. of water. Mix these two solutions together in an earthen vessel and apply the mixture to the brass with

a brush. Smaller quantities can be mixed in like proportions. To obtain the tiffany-green finish, immerse the brass in a solution of copper sulphate, 8 oz., ammonium chloride, 4 oz., zinc chloride, 1 oz., acetic acid, 2 oz., and water 1 gal., also mixed in an earthen or porcelain vessel. If the color is not uniform after the first immersion, allow the work to dry and repeat the operation as often as necessary in order to obtain the desired effect.

Lye Test for Impurities in Sand

When mixing concrete, a fair idea of any impurities in the sand can be obtained as follows: Dissolve lye, 1 heaping teaspoonful, in $\frac{1}{2}$ pt. of clean water, contained in a glass jar. Pour $\frac{1}{2}$ pt. of the sand into the water, replace the jar cap and shake vigorously for two minutes. After the mixture has settled for about 24 hours, the water will be clear if the sand is free of impurities. If the water is no darker than apple-cider vinegar, the sand will be suitable for use, but if darker, it should be washed until the test shows it to be sufficiently clean.

Blueprint Files Resemble Boiler Flues

A sheet-metal contracting firm in Omaha, Nebr., has a file for its blueprints that resembles the flue system of a boiler. Sheet metal was used to form supports for metal tubes, which were left open at the ends. With the tubes marked in alphabetical order, filing and finding blueprints is comparatively easy. This method also keeps the prints nicely rolled and well protected from dust or other damage.

Teeth on Back of Saw Blade Used for Cutting Nails



Teeth filed on the back of a saw blade are useful for cutting nails imbedded in old lumber. They should be filed straight across at right angles to the blade and must not be set. When a nail is encountered, it is a simple matter to reverse the blade and cut through it. If desired, the section where the extra teeth are cut, may be hardened.

Chain-Link Jig for Bending Work in a Vise

Clamped in a vise, one link from a discarded heavy chain is useful for bending strap iron. Two links, similarly clamped with small work between them, will serve as extension jaws, or for filing work without marring the vise jaws.



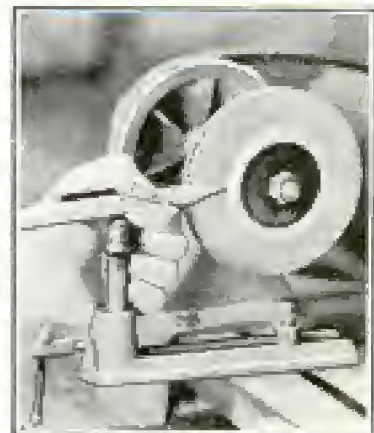
Pinch Bar Fitted with Rollers Is Handy for Moving Heavy Objects in the Shop

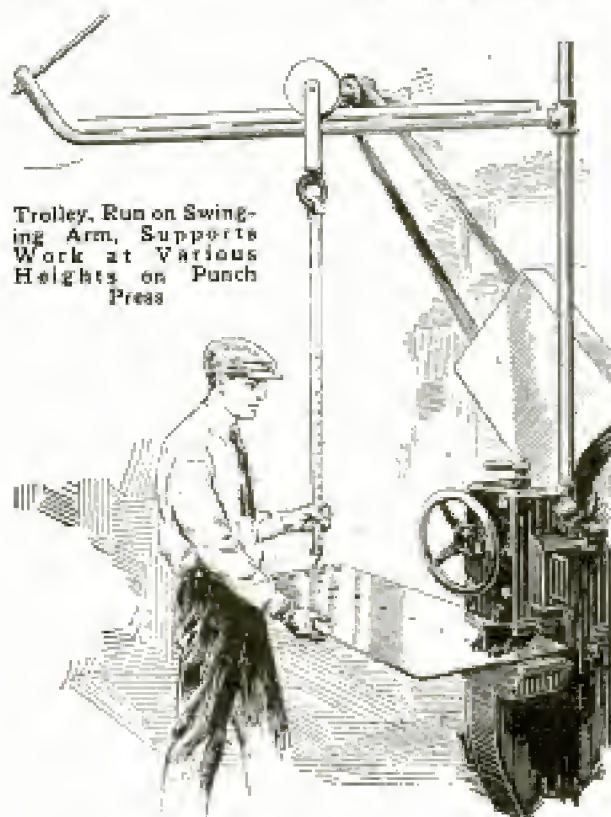
A Roller Pinch Bar for Moving Heavy Objects

Fitted with rollers, this pinch bar is handy for moving heavy objects where crane facilities are not available. It consists of a length of heavy bar iron, shaped as shown in the detail, and fitted with two small iron rollers which turn on a pin inserted through a hole at the end of the bar. In use, the end of the bar is run under the object so that the load comes at B; then, as the handle is lowered, the center line of the load moves to A, or even a little farther.

Dowel Rod Quickly Pointed on Side of Emery Wheel

Dowel rods can be quickly and neatly pointed by rotating them against the side of an emery wheel. If the wheel is mounted in a lathe, the tool-rest, set at the correct angle, will make a good support for the work. This method is useful when pointing a lot of rods.



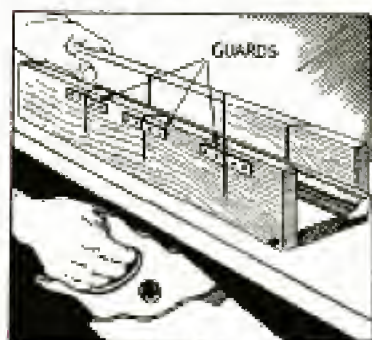


Trolley, Run on Swinging Arm, Supports Work at Various Heights on Punch Press

Swinging Arm to Support Large Work on Punch Press

For work that must be held at variations in height on a punch press, the illustrated swinging arm will be found useful. It is made of pipe and fittings as shown, the arm acting as a trolley for a pulley from which is suspended an iron bar drilled with a number of holes. An S-hook is used in one of the holes in the bar for adjusting the work to the right height for punching.

Worn Slots in Miter Box Repaired with Hardwood Strips



hardwood strips. Screw one of these strips on each side of the slots as shown, so that they serve as guides and hold the saw. When the strips become worn it is an easy matter to replace them.

Slots in a wooden miter box, that have become enlarged from continued use and hence will not cut to correct angles, can be repaired with

Iron Filings Will Increase Yield and Quality of Fruit Trees

Tests made over a four-year period with cherry trees and grape vines, in the same lot and under similar conditions, have proved that a few handfuls of iron filings buried around the roots of the trees during the fall or winter months will give them greater vitality, resulting in larger yields and better quality of fruit. The filings oxidize under the action of air and moisture and the iron oxide thus formed is absorbed by the roots.—Ralph W. McPherson, Omaha, Nebr.

Safety Razor Holds Short Section of Steel Rule

Inside measurements that are hard to get without the proper tools can often be taken by using small sections of a steel rule held by means of a safety razor. Cut a steel rule in sections of different lengths and clamp them between the jaws of the razor handle. The handle enables the user to get the small rule into places where it cannot be held by the fingers.



Using Carbon Tetrachloride in Confined Places

The commanding officer of a submarine recently reported that two men were affected with nausea and vomiting while cleaning the motors with carbon tetrachloride. Because of its non-inflammability, this chemical is excellent for cleaning electrical windings, but will corrode steel parts, and gives off slightly toxic gases. For this reason it should not be used in confined or poorly ventilated places.—Wilton Edgar Matthews, Annapolis, Md.

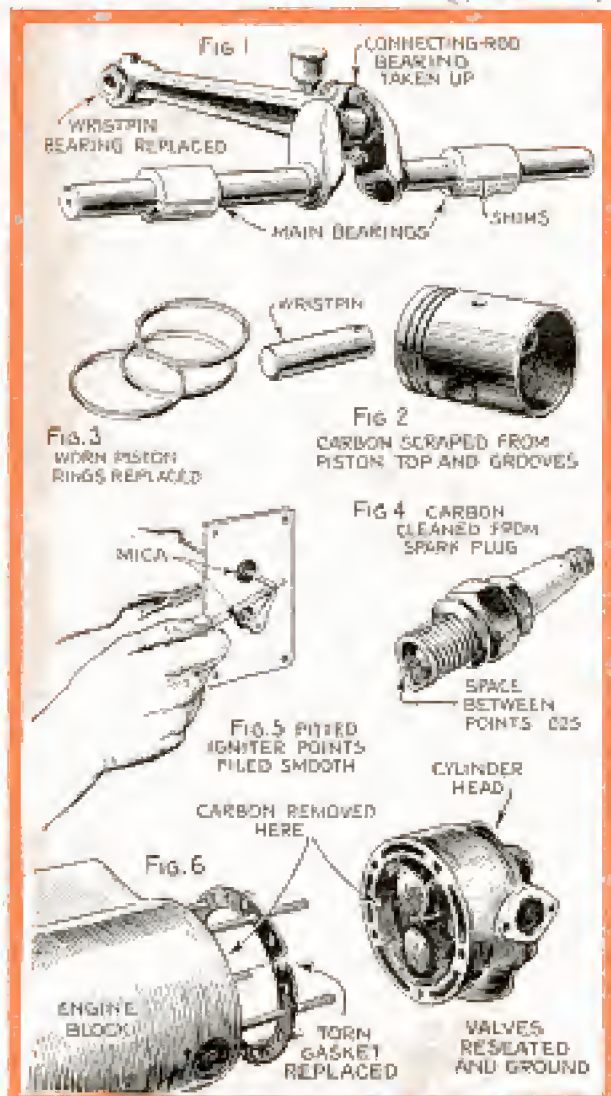
When dressing aluminum stock, light machine oil applied to a file prevents the file from clogging and tearing the stock.

GAS-ENGINE TROUBLES

You Can Cure

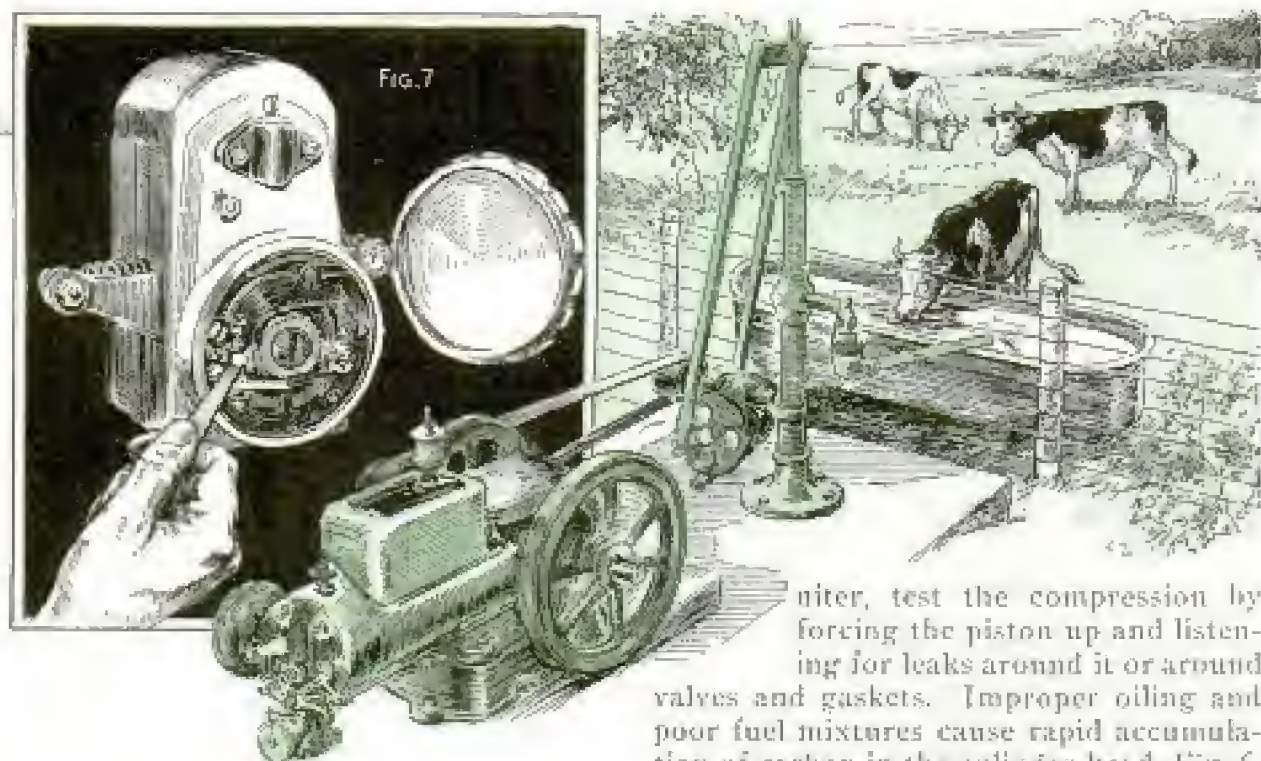
By James R. Ward

THE life of a gas engine, as of almost any other machine, depends largely upon lubrication, and this factor is neglected only too often. The oiler should be carefully adjusted to feed just the right amount. An insufficient supply allows excessive friction between moving parts, which results in rapid wear, while an oversupply causes car-



bon deposits. The consistency of the oil should be kept uniform, as nearly as possible, during both cold and warm weather, to assure the correct feeding through the cup. As oil thickens in cold weather, a lighter grade should be used to get the same consistency as a heavier grade has in the summer. The main, wristpin, and connecting-rod bearings, shown in Fig. 1, should be checked at regular intervals for play. The main and connecting-rod bearings can be tightened by removing one or two of the shims, but the wristpin bearing will have to be replaced.

When an engine refuses to start, it is usually due to one of two causes, viz., improper vaporization of gasoline or faulty ignition. If the engine uses a spark plug and a high-tension magneto, remove and clean the plug, and then adjust the points to .025-in. clearance, as in Fig. 4. Place the plug so that the base touches unpainted metal on the engine head, and crank the engine. This should produce a hot spark at the plug points. If there is no spark, check the wiring for loose connec-



tions and broken insulation. In case the trouble is not found here, the magneto is probably at fault, Fig. 7. Magnetos sometimes become gummed with oil, which interferes with their operation. This condition can be quickly remedied by cleaning the inside with a gasoline-saturated cloth. While you have the cover off, file down the breaker points with a coil file, removing all pits and corrosion, to provide smooth contacting surfaces. For engines having a make-and-break ignition, remove one of the wires from the igniter, and with the switch on, brush the wire across the engine block. This should produce a number of hot sparks. If not, check the batteries and vibrator coil for loose connections, and the wires for broken insulation. Also test the battery with an ammeter. Each dry cell should test over 12 amp. If they test less, they should be replaced, since this amperage is not sufficient to produce a spark hot enough to fire the fuel charge under compression. Next, remove the igniter and see that the points make good contact. In order to produce a hot spark, the entire surface of the points should make a good electrical contact, possible only when they are thoroughly clean and smooth, a condition that can be obtained by occasional filing, as in Fig. 5.

After replacing the spark plug or ig-

niter, test the compression by forcing the piston up and listening for leaks around it or around valves and gaskets. Improper oiling and poor fuel mixtures cause rapid accumulation of carbon in the cylinder head, Fig. 6, and on the piston. This should be scraped off with care, so as not to mar the cylinder wall. The valves should be reseated and ground, and replaced if they are warped. Also, the piston should be removed and the carbon scraped out of the ring grooves. It may be necessary to replace the piston rings, Fig. 3, if the engine has had long service.

Next, check the timing. The spark should appear at the end of the compression stroke. The exhaust valve should open at the end of the power stroke and close at the end of the exhaust stroke. See that the rocker arm opens the exhaust valve wide enough to allow the burnt gases to escape quickly. The stem of the exhaust valve often becomes covered with carbon so that it will not properly open or close. If this is the case, it should be removed. Examine the cam gears and replace all worn parts. As gas engines are subjected to strong vibration, they should be inspected at regular intervals and all loose bolts tightened.

Uniform Stain on Black Walnut

Black-walnut wood trimming can be given a uniform stain by using a high-grade paste wood filler, tinted with a little black umber. This assists in producing an even surface on which to apply the finish, whether oil, varnish or wax.

Tester Sprouts Seed Corn in Wet Sawdust



Made from an Egg Case and Fitted with a Lamp, This Tester Germinates Seeds Quickly



Heated by means of an electric or small oil lamp, a good seed tester can quickly be improvised from a 30-doz. egg case cut in half. Cleats are nailed to the sides to hold a piece of sheet metal upon which the egg-case filler is placed. Handles for removing the bottom are made by leaving lugs on the edges and bending these up vertically. The lamp is placed in a receptacle fastened to the bottom, and a small stand to hold a sheet-metal shield is ar-

ranged directly over the lamp to distribute the heat evenly. In use, wet sawdust is placed in the compartments of the filler and the seeds inserted. Take five grains from different parts of each ear and place them in separate sections, laying the ears in rows to correspond with the sections of the tester. Another piece of sheet metal is placed over the tester as wood will warp. Examine frequently and add water as needed.—Floyd Mix, Chicago.

Wall Rack Holds Taps Orderly

Taps are always handy, and the waste of time in looking for the correct size when they are scattered around or piled in a box, is eliminated if this rack is used. It is simply a wide board set at a slant to the wall above the workbench, with wooden partitions to separate the taps, and a narrow piece nailed along the lower edge to prevent them from sliding out. The size of each tap is marked on this piece for ease in locating the proper one.



Rack for Taps Keeps Them Handy and Helps in Quickly Selecting Correct Size

☛To hold valve keys in place while releasing the spring, apply heavy grease to the pin; this will prevent it from slipping.



Inflating Rubber Gloves over Wooden Disk Helps in Detecting Small Holes

Inflating Rubber Gloves to Find Small Holes

When rubber gloves are worn by workmen handling acids or doing electrical work, they must be free from small holes. These holes are hard to locate without some means of inflating the glove. A simple device for this purpose consists of a wooden disk mounted on a suitable stand, with an air connection in the center. The open end of the glove is held against the disk, as shown, by means of a wooden ring, which is kept to the stand tightly with a small C-clamp. In this way the glove can be inflated so that small holes will make themselves apparent.

Large Vise Holds Smaller One

A small vise can be made handier to use by clamping it to a large bench vise. Twist a $3\frac{1}{2}$ -in. length of $\frac{1}{2}$ -in. flat iron as



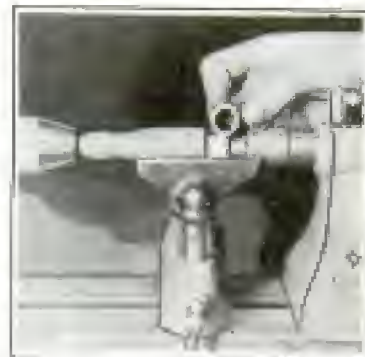
shown. Clamp one end of it in the bench vise and then attach the small vise to the other end. In this way, the latter can be raised to a position that will be most convenient for doing the work.

Correct Way to File Circular Saw

Few saws are so likely to crack in use as circular cut-off saws, for the reason that they are often incorrectly filed with a square corner at the base of the teeth, the bevel on the face of the teeth being carried their full length. After beveling the front of the teeth, a round file should be used at the base to prevent the formation of square corners, from which the cracks usually start. A cut-off saw will clear the work well if the bevel is filed only halfway down the length of the teeth. —W. L. Brown, Gravette, Ark.

Ferrules Cut from Pipe Protect Small Tool Handles

Fitted over the end of a wooden tool handle, a $\frac{3}{4}$ -in. length of pipe will prevent it from being split or "mushroomed" by hammer blows. The end of the handle is turned down in a lathe to fit the ferrule, and the tang end is held in the chuck as indicated. —R. B. Wailes, Bethesda, Maryland.



Carbon Removed from Car Motor with Hydrogen Peroxide

For a simple and economical method of removing carbon from a motor, detach the rubber tube from the windshield wiper and insert it into a bottle of hydrogen peroxide. Then start the motor. The peroxide is drawn through the windshield-wiper tubing to the intake manifold and then into the cylinders, where the supercharge of oxygen, which is contained in the peroxide, burns out the carbon.

Applying Paint to Tile

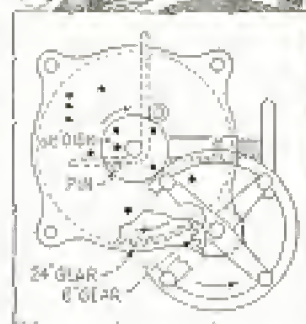
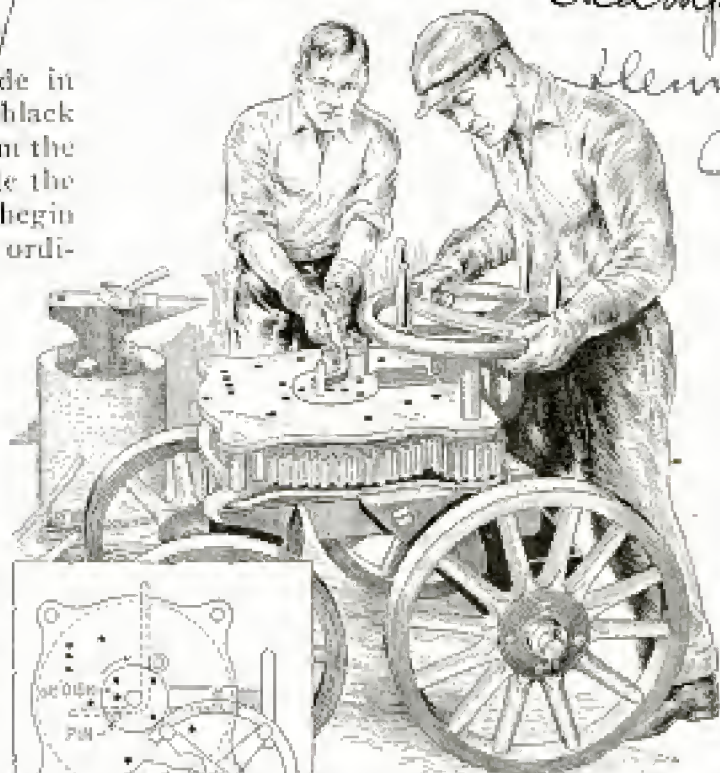
Paint will adhere to tile if the latter has been thoroughly washed and allowed to dry. Then apply a coat of equal parts of wall primer and paint, mixed in the proportion of $\frac{1}{2}$ gal. of flattening oil to each 25 lb. of heavy-paste white lead.

Paper Protects Bees in Spring

Before setting my beehives outside in the early spring, I cover them with black tar paper, which absorbs the heat from the sun and raises the temperature inside the hive. This induces the queen bee to begin laying eggs much earlier than under ordinary conditions, as she will not start until the hive temperature is quite high, and the result will be a greater number of young bees.—P. H. Ashby, South Edmonton, Alberta, Can.

How to Make Silver Solder

To braze or silver-solder sheet brass, tubing or pipe, requires so much heat that the work is likely to warp. A hard, malleable solder that flows smoothly and melts at a comparatively low heat, can be made by melting together silver, 1 part, and pure tin, $1\frac{1}{2}$ parts. If you have no soldering block, a small quantity of this mixture can be made by placing the silver in a shallow depression cut in a piece of asbestos board and heating it with a blowpipe. Sprinkle borax on the silver and continue to apply the heat until the mixture melts and forms into a ball. Then drop small pieces of the tin into the molten silver, one at a time, while applying the heat, and sprinkling on more borax until the tin is melted into the silver. After the metal has cooled, turn it over and melt it again from the other side in order to get a uniform mixture, and lay a piece of flat iron on top of it which flattens it out to a convenient shape for use. When cold, remove the metal and wash it in water to remove particles of asbestos, then tap lightly to remove the incrustated borax. Sal ammoniac is a good flux for this solder, which flows readily.



Portable Bending Machine for Heavy Bar Stock

This Portable Bending Machine Exerts Great Pressure

Mounted on wheels, this machine is handy for bending heavy bar metal, as considerable leverage can be obtained. The bending is done with a 24-in. gear, meshing into a 6-in. gear, to which is attached a steel shaft and a wheel with handles for applying pressure. The gears are inclosed in a housing made of two $\frac{3}{4}$ -in. steel plates, joined at the corners by bolts. An 8-in. disk in the center of the upper housing is attached concentrically to the large gear and turns with it. In the center of the disk a $1\frac{3}{4}$ -in.-square hole is cut to hold forms, while seven smaller holes are drilled to receive pressure pins. The stationary housing also has holes for pins.

300 Blueprints for Home Craftsmen

IN ORDER to supply our readers with workable drawings of large size (17 by 22 in.) for convenience in making the projects published in *Popular Mechanics Magazine*, we have prepared blueprints on almost everything that is of interest to the home craftsman. Prices: Single prints, 25 cents; six prints, \$1, postpaid. For more information, and a complete list of all our blueprints kindly write to Blueprint Dept., *Popular Mechanics Magazine*, 200 E. Ontario Street, Chicago.

902 Grayfield Drive
Cleveland, Ohio



"CANNON BALL" Speed Up

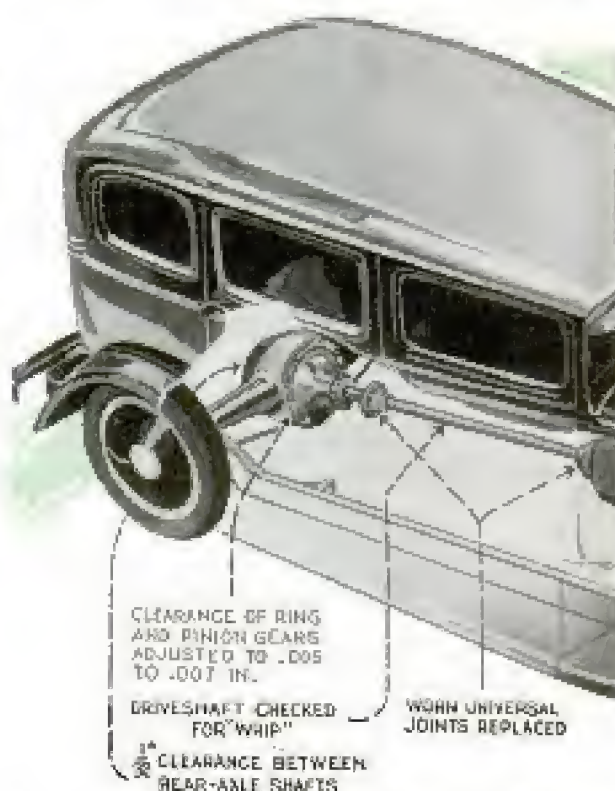
speeds above 60 miles per hour, a slight wheel misalignment often reduced the speed five per cent.

In overhauling your car with the pur-

By "CANNON BALL" BAKER

Champion Record Breaker in Transcontinental Races

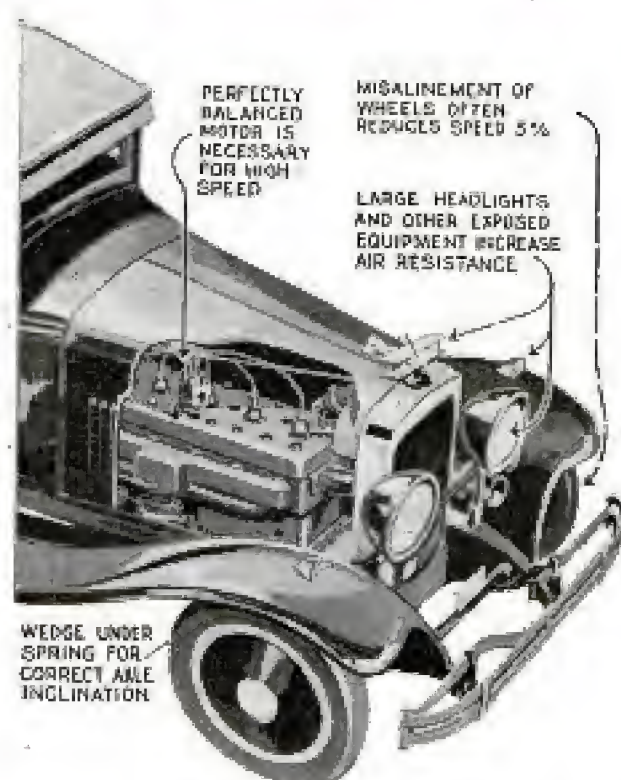
IF you intend to alter your car to increase its speed, it should be remembered that speed is mainly dependent upon air resistance, rolling resistance and engine power. As an example of air resistance, the maximum speed of a car equipped with regular headlights was found to be 87 miles per hour, but after removing the headlights, an additional 5 miles per hour was possible. In respect to rolling resistance, it was found that, at



pose of increasing its speed, wheel bearings are first examined. Remove these and wash out the old grease, replacing the rollers and other parts that are chipped or damaged. When replacing the bearings, tighten each adjustment until there is no play in the wheel as the tire is gripped and pushed from side to side. Then back it off about one-third of a turn and see that the setting is securely locked. Wash out all the old grease or oil from the rear-axle housing and differential gears with

Brutal Tests at High Speeds on the Race Track Show Up Imperfections in Design and Result in Constantly Improved Models

BAKER *tells how to* your Car



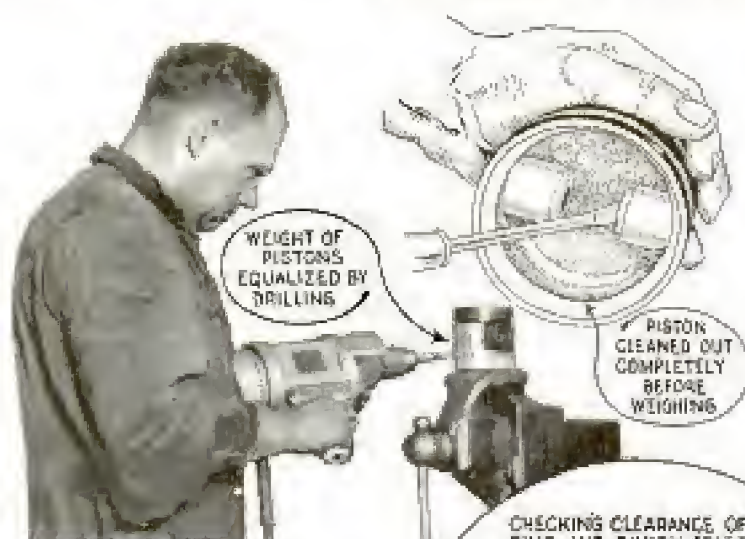
kerosene, and be sure that this is all drained out before reassembling. While the differential is open, check the backlash of the gears. The best way to do this is to take hold of the driveshaft, if construction permits, and shake the pinion, turning the ring gear until you find the point of least backlash, and then adjust for a clearance of from .005 to .007 in. Refill with castor oil up to $\frac{1}{2}$ in. on the ring gear. Next drain and flush out the transmission with kerosene, allowing it to drain long enough to get all the kerosene out, and refill it with castor oil up to the cen-

ter line of the lowest set of gears. Check the driveshaft for whip and the universal joint for play, as either whip or play will cause considerable vibration at high speeds and may completely destroy the rear-transmission bearing or the pinion bearing—possibly both. A driveshaft can best be checked between centers on a lathe. Likewise, the universal joints should be replaced if noticeable play exists.

Now examine the rear-axle shafts inside the differential housing. The ends of the shafts should not butt together, but should have a $\frac{1}{8}$ -in. clearance between them. If necessary, grind off the ends to obtain this clearance, which is important because many axles are held by the outer wheel bearings, and the expansion of the shafts, upon heating, may cause them to butt together and ruin the bearings. Also see to it that the rear-axle felt washers do not bind on the shafts.

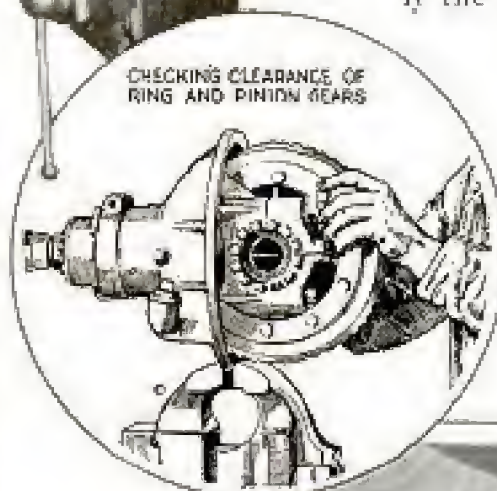
Most cars are delivered with a gear ratio that gives best all-around performance, and changing will make very little difference in the top speed of the car in most cases, unless it is stripped of fenders, lights, etc. The only way to know just what is right for your car is to try several ratios and note the results.

When running at high speed, all the tires, which must be in perfect condition, should be inflated to 5 lb. higher pressure than is carried for regular running. The wheels should be carefully balanced. Any tendency to settle at one point can be offset by wrapping wire solder around a spoke and taping it in position. All steer-



ing connections should be removed, cleaned, lightly lubricated and snugly adjusted. The front wheels should be adjusted so that they are parallel with each other. To measure this, first check to see that there is no wheel wobble and that the tires run true. Then spin one front wheel and, with the hand resting on a support, hold a piece of chalk against the center of the tire. This will give a good mark from which to measure. The steering gear should be adjusted so there is no play and no binding. If the car has a tendency to wander from side to side on the road, try increasing the inclination of the front axle by placing tapered shimmy wedges at the rear of the axle where it rests on the spring.

Next comes the engine. The first thing to do is to get all parts in balance, which should be attempted only in a shop equipped for this work. The matter of balance is particularly important if you are working on a low-priced car. The crankshaft, flywheel, clutch and reciprocating parts especially require this attention. To balance the pistons, first clean out all carbon from the ring grooves and from the underside of the piston head and weigh each piston accurately. If one is heavier, carefully scrape a little metal from the inside of the skirt or drill several $\frac{1}{8}$ -in. holes in it. Continue this work until all pistons are of equal weight. The rods must be balanced in two ways: Let



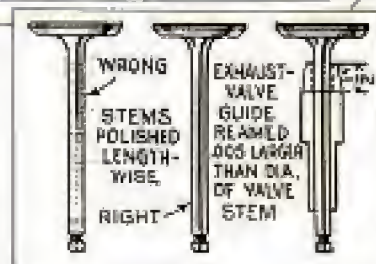
the small end hang from a string and check the weight of the large end by allowing it to rest on a scale. Variations in weight should be equalized by filing the outer surfaces at the upper half of the large end of the rods that are too heavy. Then weigh the small ends in the same way and correct variations by filing. Make a final check by taking the total weight of each rod to see that they are all exactly the same. See that the piston

pins are an easy push fit and then assemble the pistons and rods. The complete assemblies should correspond in weight within $\frac{1}{4}$ oz. With the piston rings removed and using the connecting rods as handles, try the pistons in their respective cyl-



inders. The clearance between the pistons and the cylinder walls should be 50 per cent greater

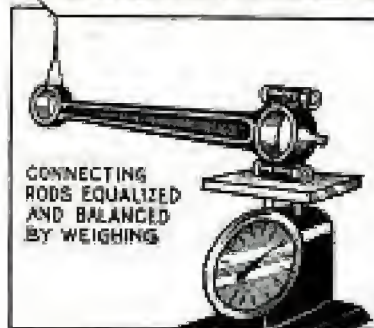
than that recommended by the manufacturers, in order to take care of the abnormal expansion caused by maximum motor speed. This may cause a piston slap when the engine is cold, but it is the only way to prevent sticking at continued high speeds. For solid cast-iron pistons allow .001 in. plus 50 per cent for each inch of cylinder bore or fraction thereof, or .006 in. for a $\frac{3}{4}$ -in. bore, which is con-



sidered as being 4 in. When checking with a feeler gauge, there should just be a slight drag on a narrow .006-in. blade. If aluminum pistons of the split-skirt variety are used, the same rule for clearance applies, but if the pistons are of solid-skirt type, the clearance should be doubled, or .002 in. plus the 50 per cent. The piston rings should be filed down until there is .010 to .014-in. clearance between their ends when compressed inside of their respective cylinders. If a piston seems to fit tight in one or two spots, these are dressed down. However, if the pistons are a tight fit all around, they should be honed to fit properly. All main and connecting-rod bearings, on pressure-lubricated engines, should be fitted to have a .003-



PISTON CLEARANCE 50% GREATER THAN USUAL



CONNECTING RODS EQUALIZED AND BALANCED BY WEIGHING

The valves and carburetion are now gone over carefully. Remove, clean and face all the valves and ream the valve seats, using a narrowing reamer to make the valve port as large as possible. When finishing with valve-narrowing tools, see that the exhaust valve has a seat $\frac{3}{16}$ in. wide, and the intake valve a seat $\frac{1}{8}$ in. wide. When the valves are seated correctly, their heads should be ground off so



CHECKING FOR WHEEL ALIGNMENT AND Wobble

PISTON PIN SHOULD BE AN EASY PUSH FIT

STEERING-WHEEL PLAY SHOULD NOT EXCEED $\frac{1}{4}$ "

in. clearance. For splash-lubricated engines, a tighter fit is needed, the bearing being perfectly free but not loose.

that there are no sharp edges or burrs, as these become red-hot and cause detonation. Then polish the valve stems with very fine emery cloth. Polish them lengthwise and not across the stem as this causes scratches that will collect carbon and may make the valves stick at high speed. Lap the valves in lightly until the seats show an even gray color all around the contacting surfaces. Valve stems should work entirely free, but not loose, in their guides. When the engine runs at high speed, the head of the exhaust valve becomes hot, causing it to expand at the top of the stem, and therefore the top part of the guide should be reamed .004 to .005 in. larger than the diameter of the valve stem. It is a good idea to install an entire set of new valve springs, as the old ones will probably have lost their tension and strong springs having uniform action are necessary at high speed. When setting the valve clearance, follow the manufacturer's recommendations. If no information on this subject is available, cover the radiator and run the engine until the water boils. Then set the clearance of each valve at .004 in. while the motor is hot and running intermittently. If the car has been run less than 10,000 miles, the camshaft should be removed and the bearing clearances increased 50 per cent. A special racing camshaft will speed up the engine considerably. A racing camshaft

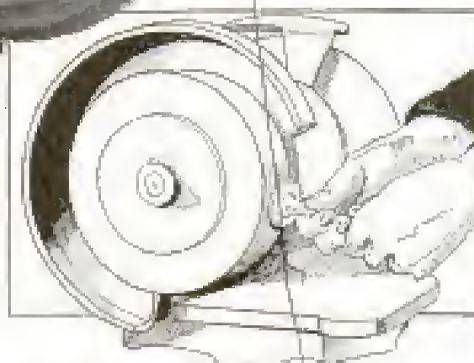
*Green Engineering Co.
Dayton Ohio
Fennell Mfg. Co. National City*



WIRE SOLDER WRAPPED AROUND SPOKE TO BALANCE WHEELS

raises and lowers the valves very quickly and holds them at their maximum opening longer than is possible with a regular shaft.

If the motor does not knock when accelerated, the compression can be raised by having $\frac{1}{16}$ in. planed from the block or head to reduce the size of the combustion chamber, which should only be done at a well equipped machine shop. If, after trying out the motor, it still does not knock, another thin layer can be removed. The car will then operate well on non-detonating or doped fuel. As the power of an engine depends on the quantity of fuel fed to the cylinders, the inside of the intake manifold should be perfectly smooth. This may be accomplished by sand blasting, or by hand-scraping as far as possible. In mounting the carburetor on the manifold, or the manifold to the motor, be sure that the edge of the gasket does not project into the gas passage. Fitting the motor with a larger carburetor and intake manifold may also be helpful. When tuning up, a larger jet or richer setting will boost the speed, but will reduce the number of miles per gallon. With the higher compression and high speed, it will probably be necessary to use different spark plugs. Practically all spark plugs are now avail-



VALVE TOP GROUND SMOOTH

to hot running. By carefully experimenting, you can find a plug that will serve best in your engine the way you drive it. After a lively run of about 10 miles, remove and check the plugs. A light tan on the insulator with a slightly oily film is ideal. A white insulator indicates a hot plug, while a dark insulator means the plug is running too cool. The spark-plug gap should be about .018 in. The ignition points should be cleaned, the springs on the moving points replaced and the points adjusted for a maximum opening of .018 in. This setting is closer than for ordinary running, but it is necessary to give the ignition coil time to build up a charge at high speed. Using different coils and condensers will sometimes increase the speed a mile or two. Heavier ignition wire should be used, because the increased compression puts a greater strain on the insulation as the voltage for ignition is increased. It is estimated that the fan requires 7 hp. on a large

engine when the car is running 65 miles per hour. If you are running at high speed at all times, it may be possible to disconnect the fan.

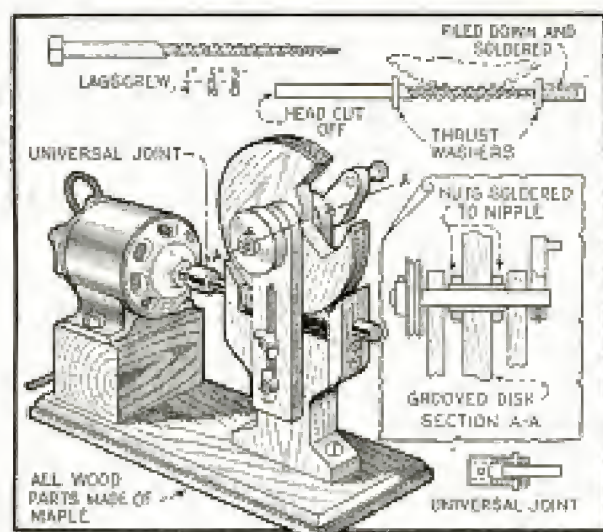
In testing out the car, an increase in speed may perhaps also be effected by varying the camshaft timing. Start out with this set according to factory recommendations, and then, when you know just what your car will do, advance the camshaft one tooth. If this results in improvement, try another tooth ahead and repeat until the engine runs at the greatest possible speed.

Screweyes Held on Piston Ring

By slipping screweyes, washers and nuts on an old piston ring, any particular size selected can readily be pulled through the opening in it. The ring can be hung on a nail over the workbench.



Speed Reducer for Moving Window Display



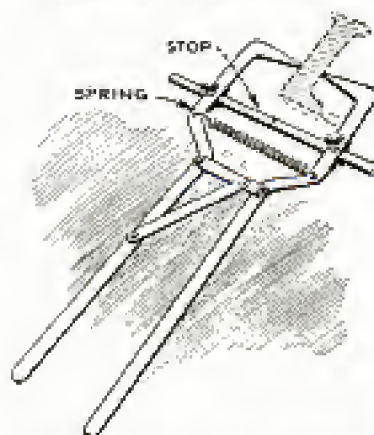
Made from Maple Parts, This Worm Gear Gives Wide Range of Speed for Moving Window Displays

For operating mechanical devices of the small kind that are used in window displays, a speed-reduction gear is often needed. The homemade worm-gear assembly shown was designed for use with a small electric motor of less than $\frac{1}{8}$ hp., and it enables a wide range of speed. The worm is a lag screw of any size from $\frac{1}{4}$ to $\frac{1}{2}$ in. The driven gear is a grooved maple disk. The use of disks of different sizes gives variety of gear ratios, the same worm being used for all the disks. It is best to turn the disks on a lathe, although they can be cut with a saw and grooved with a round file. After the wooden brackets and the base have been made up, two lag screws are fitted with thrust washers as shown in the upper detail. Three flutes are cut in the threads of one lag screw with a three-cornered file to serve the purpose of a tap. It is placed in its respective bracket and the disk is brought to bear down upon it. The shank of the screw can be chucked in a hand drill and turned. It will rotate the disk and cut teeth. When a complete turn of the disk has been made, examine the threads to see that they match at the starting point, and repeat the operation until teeth of substantial depth have been cut. The tap is then replaced with the other lag screw which serves as a permanent worm, and is hooked up to the driving motor. Graphite and oil are used for lubrication. No bushings are needed on the worm shaft as the



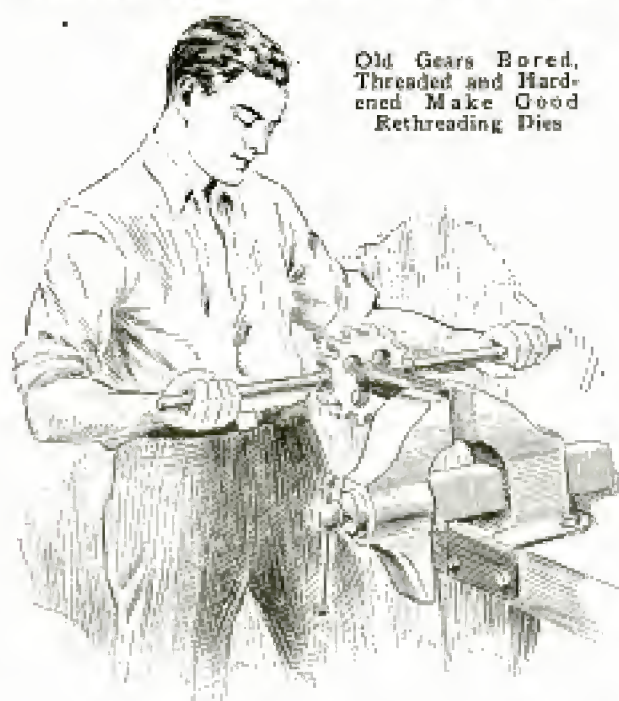
maple itself, with free use of graphite, makes a good bearing. The insert shows the shaft fitted with a pulley and crank. Either can be used as the case requires. Note that the bracket supporting the disk, is slotted to be adjustable over a wide range, which allows the use of different-size disks. The right-hand drawings show the machine put to use for operating window-display signs.

Calipers to Measure Irregular Work



Work that is flanged or of irregular shape, where step-over jaws must be used, is easily calipered with the illustrated tool. The jaws are forged from mild steel and pivoted together by means of a brace rigidly attached to one of them. Two stop rods fitted into slides provide the adjustment, while a small coil spring furnishes the necessary tension on the jaws.

Rethreading Die Made from Old Gear

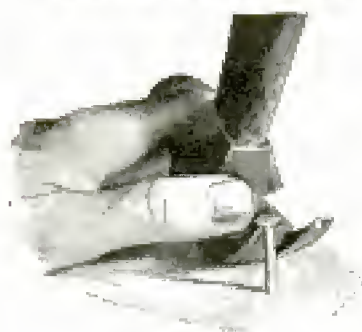


As the stock for making rethreading dies, where the diameter of the thread is over 2 in., was hard to get, a machine shop in Washington, D. C., converted a number of discarded auto gears into dies. The steel used in these gears is of high quality and will stand the hardening treatment necessary.

Preventing Erasure of Lines on Ruled Tracing Cloth

Draftsmen who letter lists and charts on tracing cloth that has been previously ruled, often experience trouble by having the lines obliterated when making an erasure. To overcome this, rule the lines on the glossy side of the cloth and letter the lists and charts on the dull side. Erasures can then be made without injury to the lines.—Jules J. Sickman, Harvey, Ill.

Notched Claws Improve Hammer



Notches filed in the end of each claw on a hammer enable you to get greater leverage when pulling long nails. If the end of one of the claws

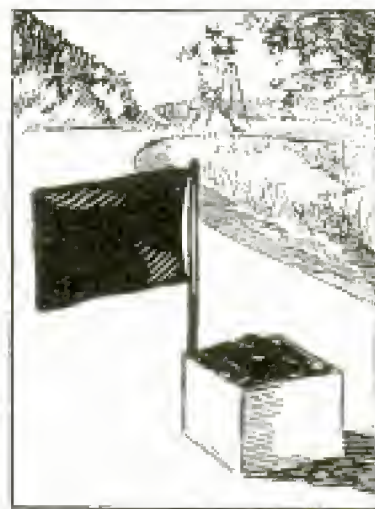
is filed down to a thin edge, it can be used for pulling tacks. The notched claws also provide a good grip when pulling staples. Of course, discretion should be used in applying the claws to nails as they may break if subjected to excessive strain.

How to Solder with Leadfoil

When using leadfoil to sweat together thin metals, such as sheet brass and copper, thoroughly clean the surfaces to be soldered with sandpaper or emery cloth so they will be slightly roughened in order to assure perfect adherence of the foil. Then apply a coat of flux to the work, sandwich a layer of foil between two layers of tinfoil and place these between the pieces to be soldered. Next, lay the work on a flat surface, on top of the assembly, place a piece of flat iron or steel that has been heated to a red color, and weight the whole down with a heavy stone until cool. The work absorbs the heat and melts the leadfoil.

Dirt-Filled Box Holds Warning Flag

When it is necessary to erect a warning flag on a hard surface, a cardboard box can be used as an anchor to hold it in an upright position. Fill the box with dirt or sand and stick the flag-staff down in one corner. While this anchor is not lasting, it will save the cost of a metal stand.



Stoppers for Screw-Cap Ink Tubes

Printers, having an assortment of inks in tubes on which the stoppers often become stuck, will find it an advantage to drill a hole through the top of the cap and use a woodscrew as a stopper. When the ink is needed again it is a simple matter to remove the screw.—Robert A. Foss, Laconia, N. H.

Solution for Staining Polished Metal to Show Scribed Lines

When laying out work on polished brass or steel, the finely scribed lines and punch marks will be more visible if the work is first stained. A good stain can be made by mixing methyl violet, $\frac{1}{2}$ oz., and clear shellac, 1 oz., and then adding enough denatured alcohol to make a volume of $\frac{1}{2}$ pt. When brushed on the polished surface of metal, this stain produces a bright purple color, on which finely scribed lines are easily seen. The stain can be removed with fine emery cloth or steel wool, and will not injure the surface of the work.

Pointed Saw Removes Old Flooring

For wiremen, plumbers and carpenters the illustrated saw is useful in tearing up old tongue-and-groove flooring and replacing it with as little damage as possible. With a pair of dividers, scribe an arc from the point of a tooth 3 in. from the end of the saw blade to the upper corner. Cut away the portion outside of the line and grind the edge down on an emery wheel being careful not to burn the steel. A second line, inside the first, and at a distance from it equal to the depth of the teeth, is then scribed as a guide for filing the new teeth. A handsaw prepared in this manner will remove the tongue in the flooring without the necessity of drilling a starting hole.—Kenneth B. Manning, Lemoore, Calif.



Rounding End of Handsaw Provides Means of Removing Flooring without Damage to Surrounding Surface

Dents in Musical Instruments Removed by Using Solid-Rubber Ball and Hammer



Removing Dents from Cornet Bell

With a rubber ball and hammer, I have successfully removed dents from the bell part of cornets and other tubular instruments. I place a solid rubber ball inside against the dent and tap the ball lightly with a hammer and stick. With a little care and patience, the dent can be removed so that it will be almost unnoticeable.—A. H. Waychoff, Phoenix, Ariz.

Plaster Casts That Are Unbreakable

Casts that are hard and will stand severe casting heats, can be made as follows: Mix powdered borax, $\frac{1}{4}$ lb., and dry plaster of paris, 1 lb. Then add enough cold water to bring the mixture to a smooth puttylike consistency, after which more plaster is added until the whole becomes very stiff. The borax keeps the plaster from setting during the mixing process and will keep it fairly plastic until long after it has been pressed into a mold. If the mixture becomes too stiff, add water sparingly until it thins out to your requirements. Allow the cast to dry in a warm place from two to eight hours, and it will then have the hardness of granite.

☛ Sandpaper wooden handles on tools to prevent getting splinters in your hands.

A 2412 Cont. Sam Lloyd.
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Brooklyn, NY

Can You Solve these Puzzles?



HERE is something different. The twenty-three disks upon our blackboard are in orderly arrangement with respect to being in rows and columns. How many different combinations of three-in-line are to be found upon the board? The line must pass through the centers. For example, 1, 3 and 6 is a combination of three in a straight line; 1, 13, 20 is another and 4, 12, 22 a third.

FARMER Smith worked a field of grain on shares, agreeing to give Jones, the landlord, three-sevenths of the crop. Smith used some wheat, and he and Jones agreed that it was worth \$54, which would be \$10.80 less than the value of the same number of bushels of rye, for they figured

twelve bushels of rye were worth \$5.04 more than six bushels of wheat. Jones preferred rye for his initial share, so Smith's problem is to figure out how many bushels of rye he should give Jones to offset the \$54 worth of wheat he had taken.

Answers to Last Month's Puzzles

Placing the figure 1 before the five-figure number A on Mrs. Terwilliger's blackboard obviously increases it by 100,000, so it then amounts to A plus 100,000. The figure 1 placed after the number A, its condition after A plus 100,000 has been multiplied by three, is equivalent to multiplying it by 10 and adding 1. Therefore, $3A$ plus 300,000 equals $10A$ plus 1 and A is 42,857.

In beginning the fish fight, nine of the little ones, matched three to one against three of

the kings, held them at bay, while the remaining four devilish dispatched the fourth king in three minutes. The thirteen devils then were able to bring an overwhelming force against each of the remaining three kings. Four devils being able to kill a king in three minutes, thirteen would kill one in twelve-thirteenths of a minute, and would destroy three in two and ten-thirteenths minutes. Thus the battle would last five minutes forty-six and two-thirteenths seconds.



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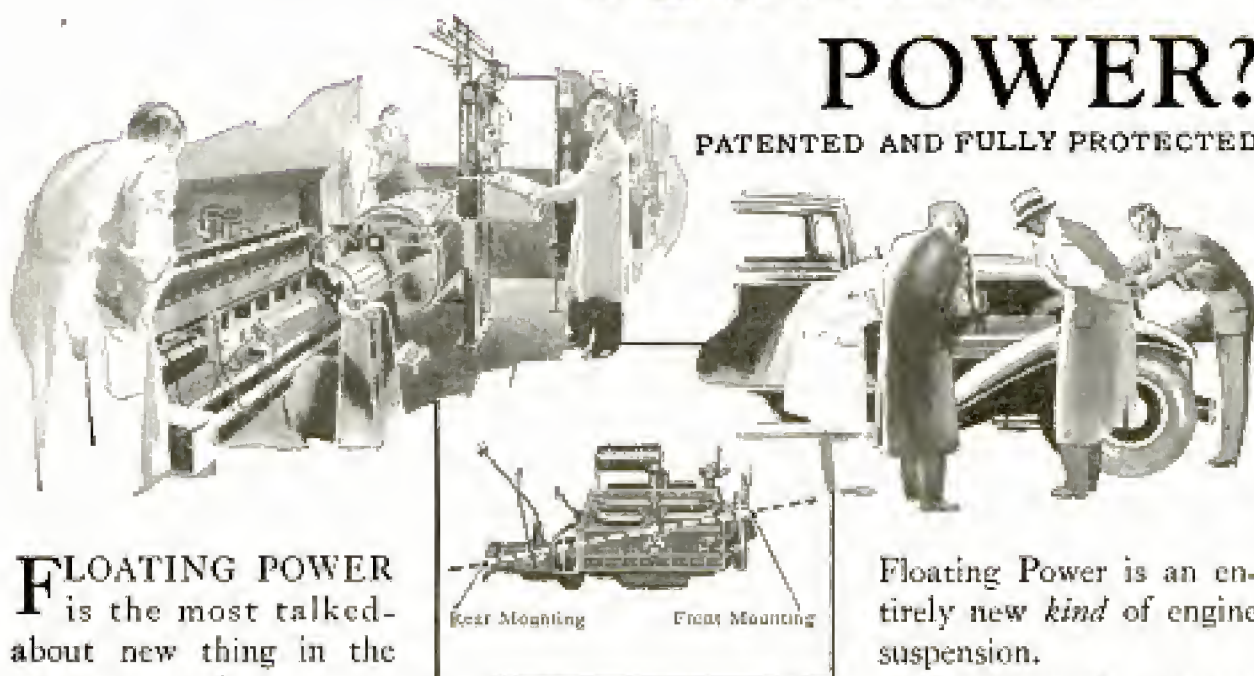
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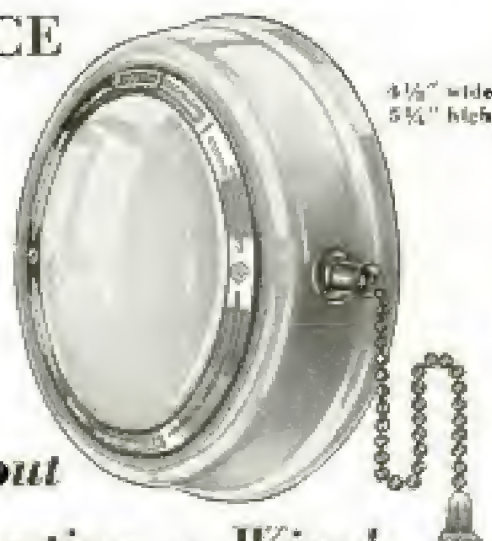
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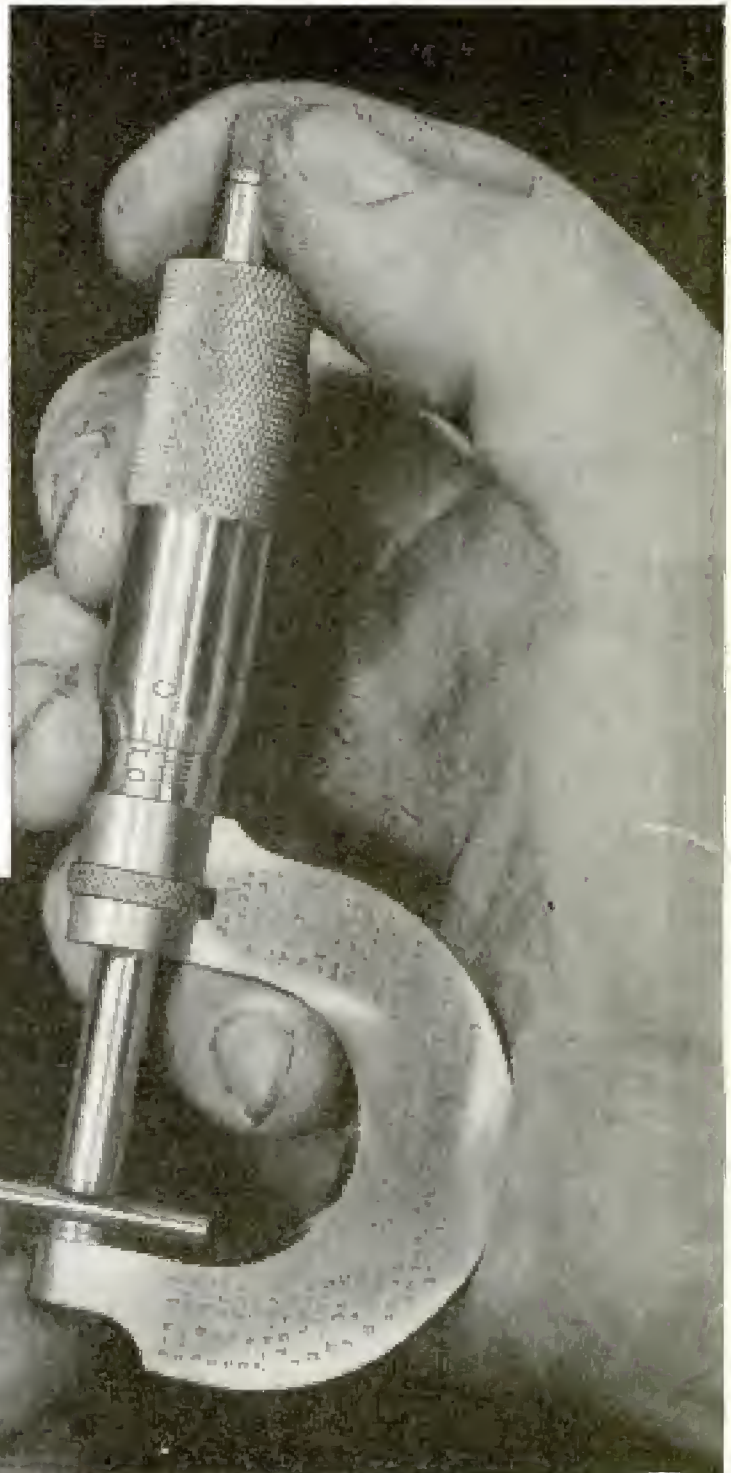
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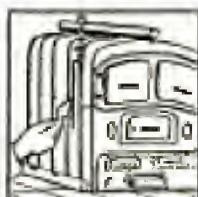
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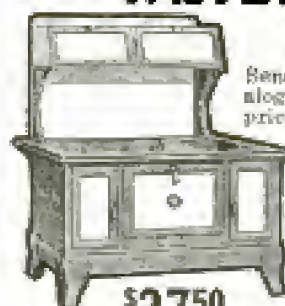
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Total Cost

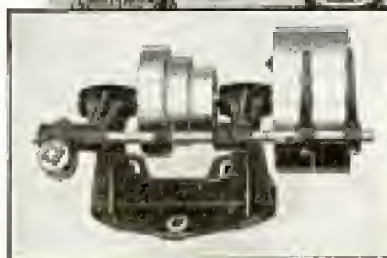
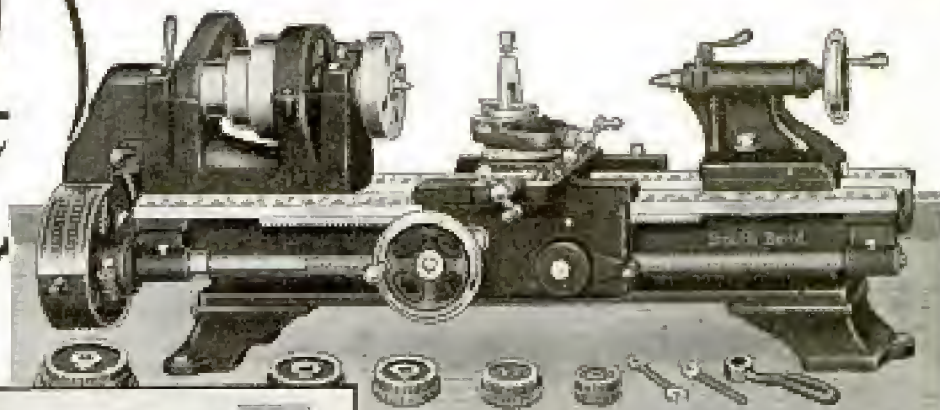
new SOUTH BEND JUNIOR 8" BACK GEARED SCREW CUTTING PRECISION LATHE

as low as
\$100

*\$20⁰⁰ Down Payment
\$7⁰⁰ a month
for 12 months*

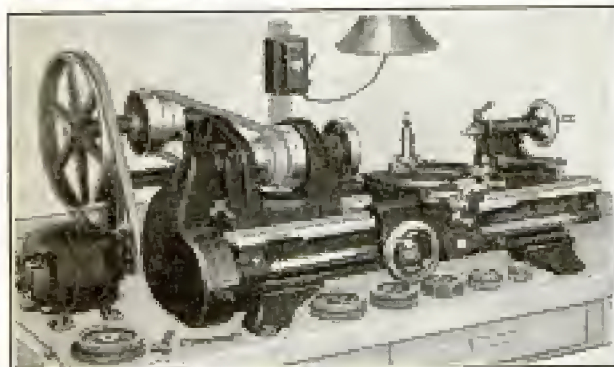
Easy Payment Terms

As low as \$7 per month will put this lathe in any shop in the United States. Other sizes from 9" to 18" swing with bed lengths from 2½ to 14 feet sold on similar easy payment terms. Send for details of easy payment plan, without obligation.



*8" x 24" Junior Back Geared Screw Cutting Precision Bench Lathe with Tight and Loose Pulley Countershaft and Equipment. \$100
\$20 down, \$7 per month. Net Weight 175 lbs.*

S. B. factory



8" x 24" Junior South Bend Back-Geared, Screw Cutting, Precision Bench Lathe, with graduated Compound Rest, Horizontal Drive Unit and Lathe Equipment \$115.00

*¼ H. P. Non-Reversing Motor, 1800 R. P. M.
(1-phase 60 cycle A. C. 110 volt) \$12.00
¾" groove pulley for motor 1.25
Knife Switch, enclosed type 1.50
¾" Belt, Motor to Drive Unit75
Flat Leather Belt, Drive Unit to Lathe Spindle (1" x 72") 1.25
TOTAL Price of Lathe and Motor Drive
Complete \$131.75*

In the tabulation above we itemize motor and motor drive equipment so you can purchase only the parts you need. This applies to any 8" bench lathe with various bed lengths.

Prices of 8" Junior Lathes with Longer Beds

	Between Centers	Net Weight	With Countershaft Drive	With Motor Drive
8" x 24"	6'	175 lbs.	\$115	\$131.75
8" x 30"	12'	190 lbs.	\$120	\$136.75
8" x 36"	18'	205 lbs.	\$125	\$141.75
8" x 42"	24'	220 lbs.	\$130	\$146.75

For lathes with plain rest, deduct \$15 from above prices.

Lathe Builders Exclusively for a Quarter of a Century
Over 55,000 Lathes in Use

A lathe of the same high quality, accuracy, precision and up-to-date mechanical features which characterize the complete South Bend line. This new 8" Back-Geared Screw Cutting, Precision Bench Lathe can be used for the finest work in tool room and shop — for gauges, small tools, dies, etc. — for auto service, electrical manufacturing, home work shop and laboratory.

Lathe has these important features: ¾" hole in spindle — set-over tailstock — ¾" diameter lead screw — power feed to carriage — plain rest (or compound rest optional) for holding tool — cuts screw threads 4 to 40 per inch — takes 1" belt — six spindle speeds — weighs 175 pounds net.

Complete line of attachments for this lathe available at similar attractive prices — including draw-in collet chuck attachment with collets, milling attachment, taper attachment, grinding attachment, thread dial, chucks, tools, accessories, all for precision work.

Write for new Circular No. 8

describing and illustrating in detail all the features of this new up-to-date bench lathe. Sent free, post-paid, to any address. Fill out and mail coupon below.

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Gentlemen: Please send circular No. 8, illustrating and describing the New South Bend Junior 8" Lathe.

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Street _____
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Now you can hide nicks, seal cracks, plug up holes—repair a thousand and one things around the house—and make an endless variety of models—with this amazing new discovery that handles just like putty and quickly hardens into wood. Wood that takes and holds nails and screws. Wood that neither cracks nor warps. Wood you can carve, paint or turn in a lathe. Wood that outlives most natural woods.

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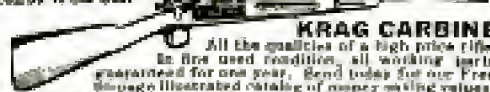
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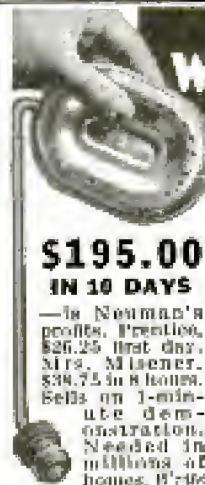
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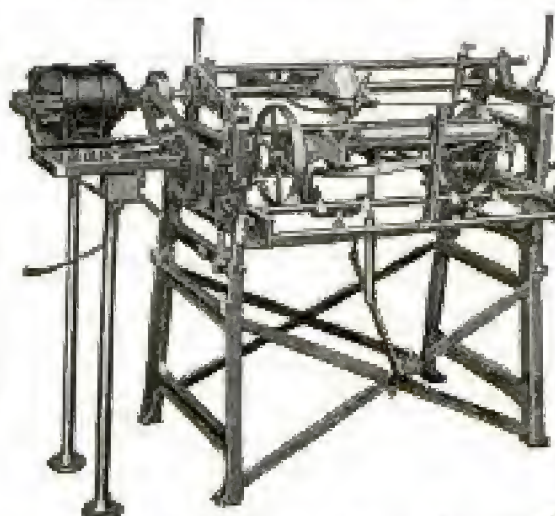
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A TWO-METHOD Sharpener—A Grinder and a Reconditioner—at Practically the Price of One

The new 1932 model Ideal Lawnmower Sharpener meets every possible condition—it is the ONLY machine that GRINDS and puts a perfect bevel and cutting edge on the old, dull, thick-bladed, hard-running mowers and also sharpens or reconditions the new, slightly-dull, easy-running kind.

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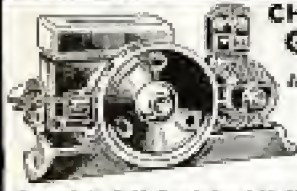
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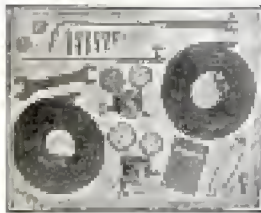
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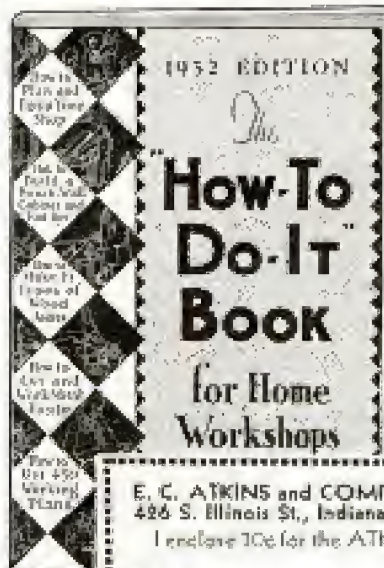
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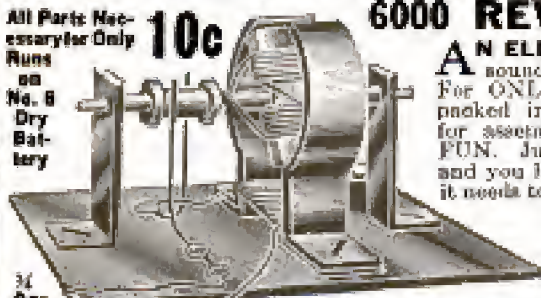
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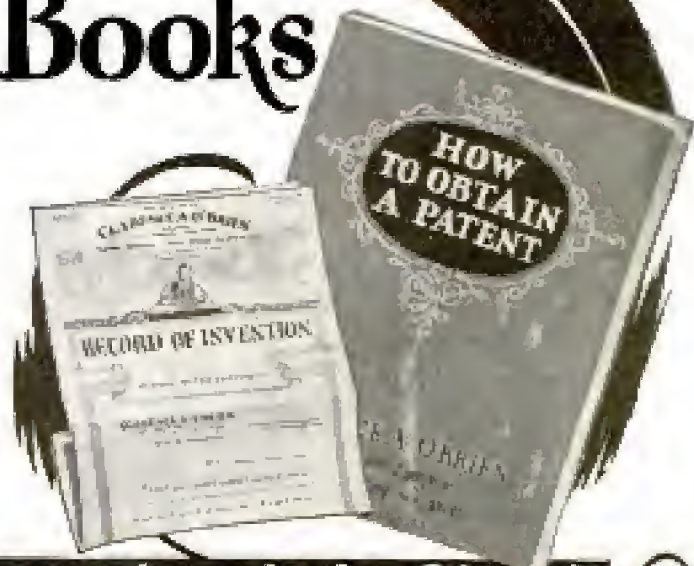
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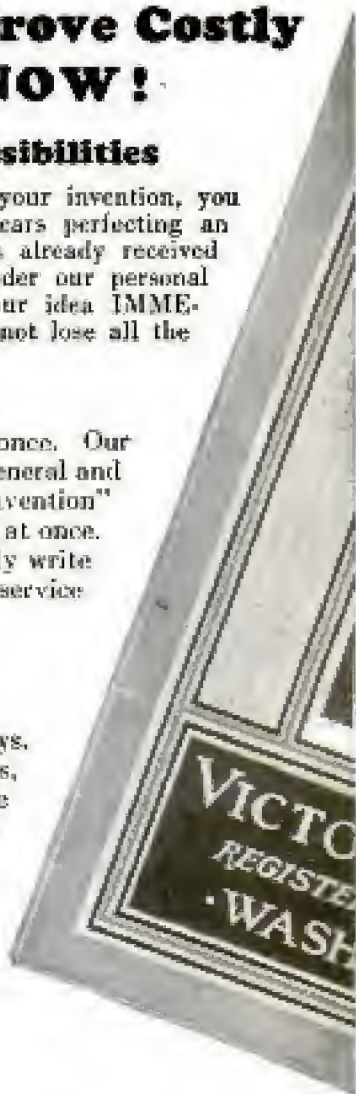
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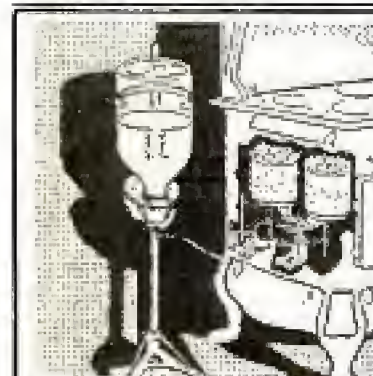
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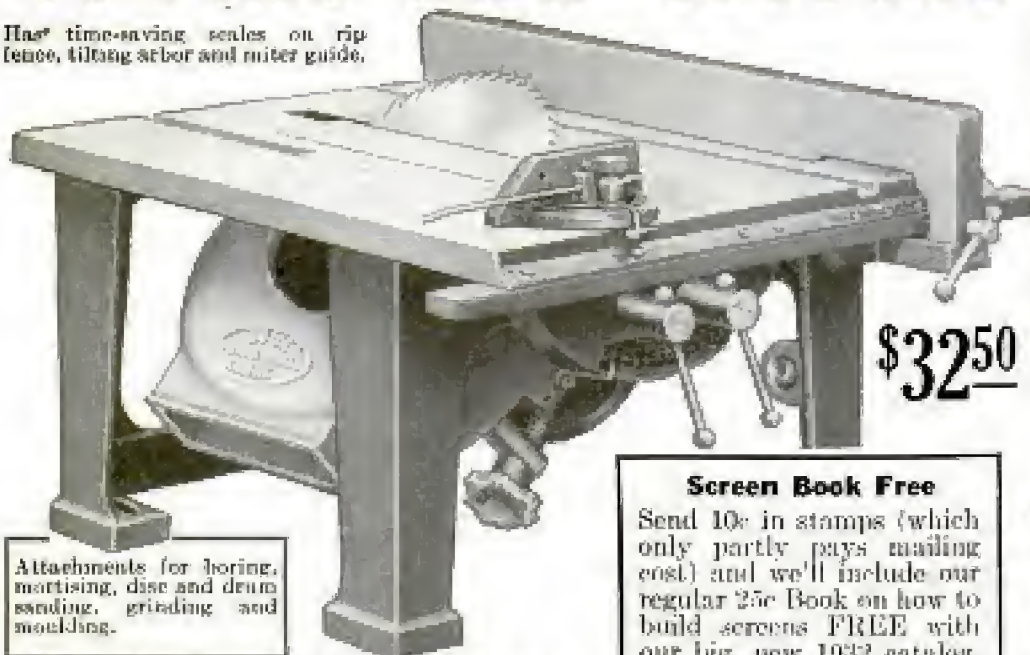


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Has* time-saving scales on rip fence, tilting arbor and miter guide.



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A marvel of true-running precision. No vibration. 11" swing; 42" center to center. Price \$29. Also 60" center to center in same model. Write about our Junior lathe at \$12.



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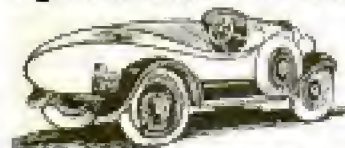
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Please send me complete set of parts for building the **Flex-Roll** Rowing Machine, including blue prints for making frame. I will pay postman \$3.98 plus postage. You agree to refund my money within one week if I am not delighted.

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By actual test, Casco is the strongest glue ever made—and yet, it's so simple to use, that you can't go wrong. All you do is mix it in cold water from the tap—and Casco is ready!

Take this large trial package of CASCO—and also our FREE folder of uses, showing you how to do things with Casco you never thought glue could do—cementing linoleum—and gluing almost every kind of material; making waterproof kalsomine; crack filler; etc. Casco is so easy to use, that even if you never glued anything before, you're sure to get perfect results on your first job. Send this COUPON for YOUR FREE SAMPLE.



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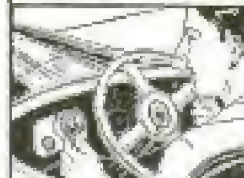
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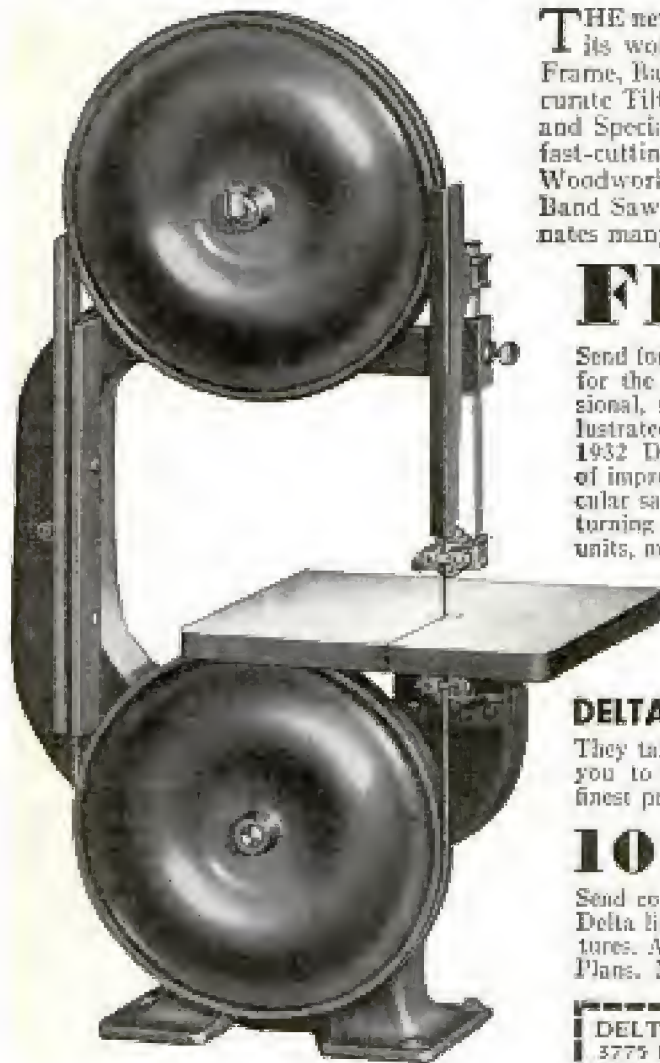
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THE new, improved 1932 Delta Band Saw has already passed its workshop tests with flying colors. The absolutely Rigid Frame, Balanced Disc Wheels, Ball Bearing Blade Support, Accurate Tilting Table, Easy Tensioning Device, Large Capacity and Special Guides make this an exceptionally safe, accurate, fast-cutting machine capable of giving years of good service. Woodworkers everywhere are also welcoming the new Delta Band Saw "Sanding Belt"—an unique attachment that eliminates many tedious hand sanding operations. (Pat. App. For.)

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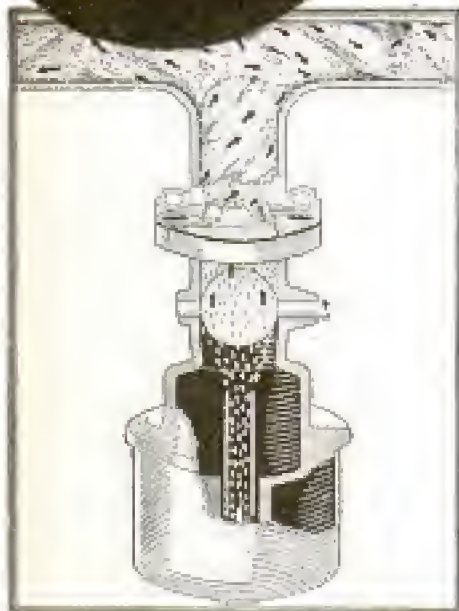
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Car owners all over the world are amazed at the results of their tests. "I have more speed, power, and increased mileage," writes Henry Bomberger. "Hills I used to take in second I now make in high." Anton Wetsch: "I wouldn't take the Whirlwind off my car for any money. I am certainly convinced." W. B. Fountain: "My mileage has increased greatly. My car has plenty of pick-up and starts like a whip."

SALESMEN AND DISTRIBUTORS WANTED To Make Up To \$100 A Week and More

Whirlwind men are making big profits taking care of local business for this fast selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MFG. COMPANY

Dept. 848-A, Station C, Milwaukee, Wis.

49 MILES Takes 2nd Place Winning Cars Equipped With WHIRLWIND GAS SAVERS

Automobile owners who have been worrying about gasoline expense will be interested in an amazing test recently conducted by a Texas Motor Car Company. Twenty-three cars were entered in a mileage economy test, the winning car running 51 miles on a gallon of gas, the second car 49 miles on a gallon. When official test records were published it was found the two winning cars were both equipped with Whirlwind gas savers.

"Peak" Contest Mileages

The amazing results obtained in this mileage contest are naturally greater than those obtained in ordinary driving. Careful throttling, most economical speeds—no traffic hold-ups—and no waste of power thru quick stops, help to bring about these "peak" mileages.

A Test On Your Car

More power, faster pick-up, less carbon, quicker starting, and increased mileage is what users say in telling of their experience with the Whirlwind. Every motorist owes it to himself to test the Whirlwind to prove the results on his own car.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you save.

GUARANTEE

No matter what kind of a car you have or how big a gas enter it is the Whirlwind will save you money. While we do not claim to produce 49 to 51 miles on ordinary driving, we do guarantee that the Whirlwind will save its cost within 30 days or the trial will cost you nothing. We invite you to test it at our risk. You are to be the sole judge.

FREE OFFER COUPON

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Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one free. This does not obligate me in any way whatever.

NAME

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☐ Check here if you are interested in full or part time salesman position.



Should she have been frank?

THIS is a case where a woman paid a high price for silence. Like so many other commendable people she kept small irritations to herself.

Little things continually cropped up to mar her happiness. Possibly she should have overlooked them entirely. Certainly it was a grave mistake to harbor bitter thoughts. She allowed petty annoyances to pile up until her patience was almost exhausted. Then her husband grew a bit careless in his appearance—even failed to shave as often or as carefully as he should. She called this the "last straw" and left him.

Is a woman correct in assuming a man is losing respect for her or himself when he

becomes careless about shaving? We think not—discomfort is a more likely reason—although stubble is a handicap in almost every business or social contact. May we suggest today's Gillette blade is the answer in cases like this.

• • •
This blade is far keener and smoother—invites frequent, close shaving. Once or twice daily use will not irritate the tenderest skin. We urge you to try this remarkable blade on our positive money-back guarantee. If you don't agree every shave is the cleanest and smoothest you have ever enjoyed—return the package to your dealer and he'll refund the purchase price.

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RAZORS  BLADES

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YOU don't have to tell the woman who has switched to Camels the benefits of a *fresh* cigarette.

She knows all about it—that's the reason she stays switched.

She has learned that the fine, fragrant, sun-ripened choice tobaccos in Camels have a perfectly preserved delicate mildness all their own.

She knows by a grateful throat's testimony

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Winston-Salem, N. C.

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See radio page of local newspaper for times



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